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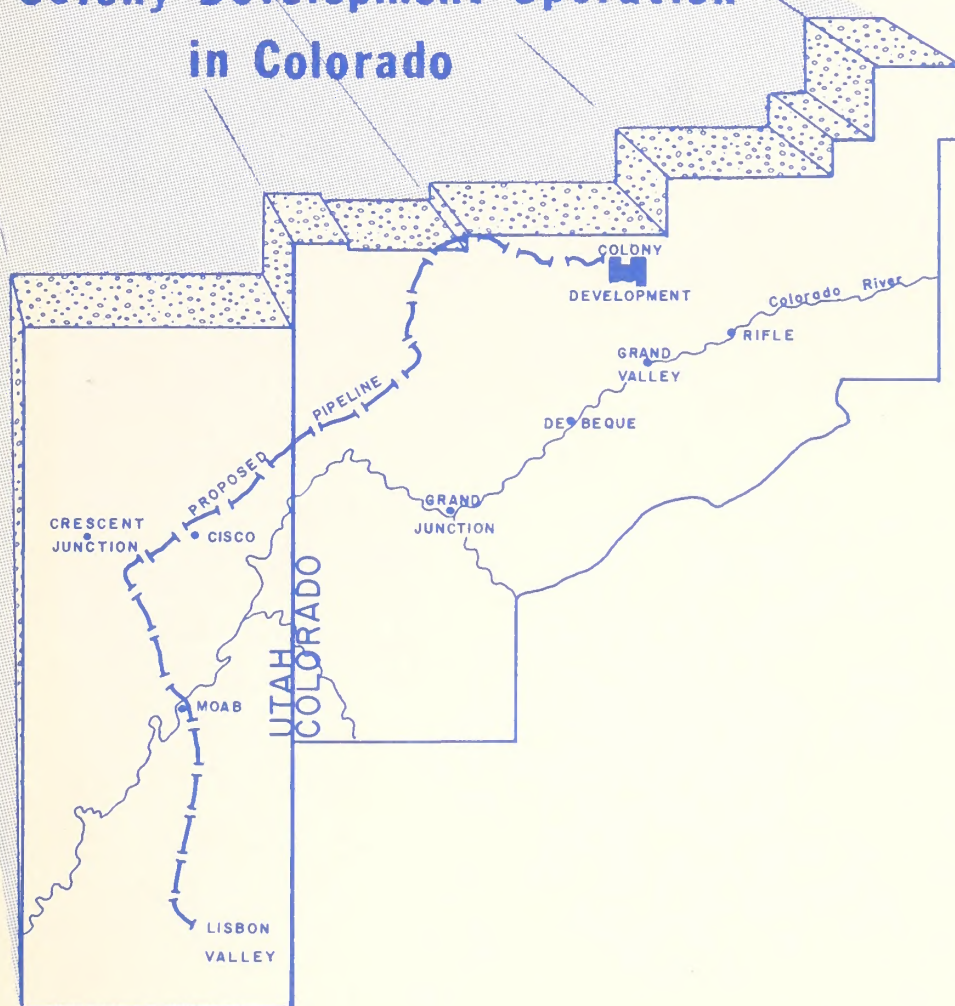
RAY A. BRADY  
GEOLOGIST

UTAH

COLORADO

**FINAL****ENVIRONMENTAL  
IMPACT  
STATEMENT****PROPOSED DEVELOPMENT  
OF OIL SHALE RESOURCES****VOL II**

by

**The Colony Development Operation  
in Colorado****U.S. Department of the Interior  
Bureau of Land Management**



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# CHAPTER

# X



CHAPTER X  
CONSULTATION AND COORDINATION

CONSULTATION AND COORDINATION IN THE DEVELOPMENT  
 OF THE PROPOSAL AND IN THE PREPARATION  
 OF THE DRAFT ENVIRONMENTAL STATEMENT

FEDERAL PARTICIPATION

In the preparation of this Draft Statement, data and/or review comments were solicited from the following bureaus and offices within the Department of the Interior.

	CHAPTER II	CHAPTER III	CHAPTER IV	CHAPTER V	CHAPTER VI	CHAPTER VII	CHAPTER VIII	CHAPTER IX	INTERAGENCY FIELD REVIEW ATTENDANCE
Bureau of Land Management	I	I	I	C	C	C	C	I	X
Bureau of Indian Affairs	I	C	I	I	C	C	C	C	X
Bureau of Reclamation	I	C	I	C	C	C	C	I	X
Geological Survey									
Water Resources Division			C						X
Conservation Division									
Bureau of Mines	C			I	C	C		C	X
Fish and Wildlife Service	C	C	I	C				C	X
Bureau of Outdoor Recreation		C		C					X
Mining Enforcement and Safety Administration	C			I					
National Park Service	C	C							
Office of the Solicitor	I	C	C	C	C	C	C	C	X

LEGEND

Comments Received - C

Inputs Received - I

## CONSULTATION & COORDINATION

Because of the other permits and actions involved in the Colony project, close coordination and input was achieved with the following other Federal Departments and Agencies.

	CHAPTER II	CHAPTER III	CHAPTER IV	CHAPTER V	CHAPTER VI	CHAPTER VII	CHAPTER VIII	CHAPTER IX	INTERAGENCY FIELD REVIEW ATTENDANCE
Federal Highway Administration	I		I						
Federal Energy Administration	I	C	I				C		
Federal Power Commission	I		C	C			C	X	
United States Navy	C	C	C				I	X	
Environmental Protection Agency	I	C	I	C	I	C	C	X	
Corps of Engineers	C	C	C	C					
Housing and Urban Development	C						C		
Department of Transportation	I	C	C	C	C	C	C	I	X
Forest Service	C	C	C	C	C				
Soil Conservation Service		C	C					X	
Health, Education and Welfare	C						C		

### STATE PARTICIPATION

Working relationships were established with State Agencies in both Colorado and Utah consistent with their jurisdictional interest in the Colony Development Operation. Consultation and coordination were achieved with the following State Agencies.

STATE OF COLORADO	CHAPTER II	CHAPTER III	CHAPTER IV	CHAPTER V	CHAPTER VI	CHAPTER VII	CHAPTER VIII	CHAPTER IX	INTERAGENCY FIELD REVIEW ATTENDANCE
Division of Water Resources	C		C						
State Historical Society	C	C		C	C		C		
State Division of Planning	C	C							
Colorado Division of Highways		I							X
Colorado Division of Wildlife	C	I	C	I	C		C		X
State Health Department									
Water Quality Control Division	C			I	C				X
Air Pollution Control Division	C	C	C	I		C	C		X
Public Utilities Commission	C						C		

STATE OF UTAH	CHAPTER II	CHAPTER III	CHAPTER IV	CHAPTER V	CHAPTER VI	CHAPTER VII	CHAPTER VIII	CHAPTER IX	INTERAGENCY FIELD REVIEW ATTENDANCE
State Highway Department	C	C	C	C			C		X
State Environmental Coordinating Committee	C								
State Land Office	C				C		C		
Division of Wildlife Resources	C	C					C		
Department of Development Services	C	C							
Department of Business Regulation	C								
State Historical Society	C	I	C				C		
Bureau of Environmental Health									
Air Quality Division	C	C							
Water Quality Division	C	C		C					
Geological Survey	C								

COUNTY PARTICIPATION

Some contacts were made in Grand Junction and other local communities. County Commissioners and County Planners from both Utah and Colorado expressed interest primarily in population projections, mine and road construction, and hunting closures due to the Colony Development. The following County organizations were contacted.

	CHAPTER II	CHAPTER III	CHAPTER IV	CHAPTER V	CHAPTER VI	CHAPTER VII	CHAPTER VIII	CHAPTER IX	INTERAGENCY FIELD REVIEW ATTENDANCE
<hr/> COLORADO <hr/>									
Eagle County Department of Planning	C	C					C		
Rio Blanco County Planner	C		C		C				
Garfield County Planner	C	C	C						
Pitkin County Planner	C	C					C		
Mesa County Planner	C						C		
District 12 Area Council of Governments	C								
District 11 Area Council of Governments	C	C	C				C	X	
<hr/>									
UTAH <hr/>									
Grand County Planning Commission	C								
San Juan County Planning Commission	C								
<hr/>									

An Interagency Field Review was held in Grand Junction on September 30 through October 1, 1974. The purpose of the meeting was to review all Chapters of the Rough Draft EIS and provide team members with comments and input into the Draft. All of the above Local, State, and Federal Agencies were asked to participate by either providing their comments

in writing or actual participation in the two-day review. A total of 39 people, representing 17 Federal, State, and Local Governments, attended the Review.

#### INDUSTRY AND PRIVATE PARTICIPATION

During the formulation of the Draft Statement, many participants were extremely helpful in providing basic input data and recommending alternatives. Institution input was received from Colorado State University, University of Colorado, Colorado College, VTN Consolidated Inc., Sernco of Denver, and Dames and Moore.

Transportation companies contributing were Denver & Rio Grande Western Railroad, Consolidated Freightways, and Union Pacific Railroad.

Energy related companies who were most helpful on the EIS were: Marathon Oil Company, Conoco, Texaco, Koch Oil Company, Public Service Company, and Gulf Oil Company.

The Colorado Open Space Council has been most helpful in providing comments on Chapters I through IX.

All of the above Federal, State and County Governments, along with the private and industrial groups mentioned, were sent copies of the preliminary Draft Statement for review.

COORDINATION IN THE REVIEW OF  
THE DRAFT ENVIRONMENTAL STATEMENT

Copies of the Draft Environmental Statement were available for inspection at the following locations:

Office of Information, Bureau of Land Management, Interior Building  
18th and C Streets, N.W., Washington, D.C. 20240  
Telephone: (202) 343-5717

Colorado State Office, Bureau of Land Management, Room 700  
Colorado State Bank Building, 1600 Broadway,  
Denver, Colorado 80202  
Telephone: (303) 837-4481

Grand Junction District Office, Bureau of Land Management  
223 Federal Office Building, P.O. Box 1509  
Grand Junction, Colorado 81501  
Telephone: (303) 242-8515

County Courthouses in affected Counties

A limited number of single copies were available and may be obtained by writing to Public Affairs, Bureau of Land Management, Colorado State Office, Room 700, Colorado State Bank Building, 1600 Broadway, Denver, Colorado 80202.

This Draft Environmental Statement was disseminated to the following Federal, State, and private agencies:

\*Environmental Protection Agency

United States Department of the Interior

\* Fish and Wildlife Service

\* Bureau of Outdoor Recreation

\* National Park Service

Bureau of Land Management

Office of Oil and Gas

\* Geological Survey

\* Bureau of Mines

Office of Land Use and Water Planning

Bureau of Indian Affairs

Office of Environmental Project Review

Office of Solicitor

\* Bureau of Reclamation

United States Department of Agriculture

\* Forest Service

\* Soil Conservation Service

Federal Power Commission

\* Federal Energy Administration

\* United States Department of Health, Education, and Welfare

Interstate Commerce Commission

United States Department of Transportation

State of Colorado Offices

Governor's Clearing House

★ Division of Water Resources

\* Agencies and organizations which prepared written responses to the  
draft statement.

## CONSULTATION & COORDINATION

### State of Colorado Offices (Cont.)

- \*State Historical Society
  - State Division of Planning
  - State Air Pollution Control Division
  - Colorado Division of Highways
- \*Colorado Division of Wildlife
- \*State Health Department
  - Water Quality Control Division
  - Air Pollution Control Division
- Public Utilities Commission

### State of Utah Offices

- State Highway Department
- State Environmental Coordination Committee
- State Land Office
- Division of Wildlife
- Department of Development Services
- Department of Business Regulation
- \*State Historical Society
  - Bureau of Environmental Health
    - Air Quality Division
    - Water Quality Division
- Geological Survey

### Board of County Commissioners

- Eagle County (Colorado)
- Rio Blanco County (Colorado)
- Garfield County (Colorado)
- Pitkin County (Colorado)
- Mesa County (Colorado)
- District 12 Area Council on Governments (Colorado)
- District 11 Area Council on Governments (Colorado)
- Grand County (Utah)
- San Juan County (Utah)

- \* Agencies and organizations which prepared written responses to the draft statement.

Other Organizations

Sierra Club

Colorado Open Space Council

\* Izaak Walton League

The Wildlife Society

Colorado Stock Growers Association

Colorado Wool Growers Association

Audubon Society

\* Natural Resource Defense Council

Society for Range Management

Wilderness Society

Rocky Mountain Center on Environment

\* Advisory Council on Historic Preservation

American Institute of Mining Engineers

American Association of Petroleum Engineers

Environmental Defense Fund

Institute of Ecology

Additional copies were distributed, and comments received from, the following agencies and organizations.

U.S. Army Corps of Engineers

Department of Defense

Naval Oil Reserve

U.S. Department of Commerce

U.S. Coast Guard

Federal Highway Administration

Energy Research and Development Administration

State of Colorado

Geological Survey

State of Utah

Planning Office

Colorado River Board of California

League of Women Voters

\* Agencies and organizations which prepared written responses to the draft statement.

PUBLIC COMMENTS AND RESPONSES

## INTRODUCTION

In this section are public comments on the DES. Public comments were received in both testimony at public hearings and in letters. Responses to those comments which deal with the adequacy of the draft statement are printed here.

All comments from the public hearings and written letters are direct quotes. Copies of the public hearings transcript and the written comments are available for inspection at the Bureau of Land Management District Office, Grand Junction, Colorado.

## PUBLIC HEARINGS

Hearings were held at the following locations, dates, attendance, and number of people testifying.

PUBLIC HEARINGS

<u>Location</u>	<u>Date &amp; Time</u>	<u>Attendance</u>	<u>Number Testifying</u>
Moab, Utah	1/27/76 1 p.m.	36	2
Moab, Utah	1/27/76 7 p.m.	49	2
Grand Junction, Colo.	1/28/76 1 p.m.	44	2
Grand Junction, Colo.	1/28/76 7 p.m.	20	0
Denver, Colo.	1/29/76 1 p.m.	65	8
Denver, Colo.	1/29/76 6:30 p.m.	24	2
	TOTALS	<u>283</u>	<u>16</u>

Responses to the comments of those individuals who spoke concerning some aspect of the EIS is in their order of appearance at the hearings beginning in Moab and ending in Denver. Comments which did not address the adequacy of the statement or did not require a specific answer are not reproduced here.

COMMENT SUMMARY

COMMENT ORIGINATOR	ENVIRONMENTAL ELEMENTS							OTHER					
HEARINGS	Air	Water	Vegetation Soils	Wildlife	Cultural	Human Health	Socio- Econ.	Pipeline	Energy Efficiency	Dam Failure	Mining	Mitigation	Misc.
L. Foy - Moab			1					2,3					
L. Pierson					1-5								
D. Bradley									1				
D. Treadway		1,2,4,5		3									
R. Huff - Grand Jct.							1,2						
D. McSparran		1-8											
H. Dole - Denver	*4-13			3			2,15			1	14		
C. Johnson		1										2,3	
K. Fletcher													1,2
A. Stokes	2,7-10		3-6				1		12,13	11,14			
D. Varisco									1,2				
K. Markey							1						
<u>WRITTEN LETTERS</u>													
#4-F. M. Stevenson				1									
#5-Soil Con. Serv.			1,2										
#7-Dept. of Health	1,3												2
#8-Hist. Soc. of Colo.					1-4								
#9-Izaak Walton									1				
#10-L. L. Ludlam							2		1				
#12-Allied Chemical	1,2												
#13-Corps of Engineers		1-3											
#14-Colony	2-5,10 18-34 68-70 83	7,8,11 35-51 62,63,71 72,75-78 80,81,89 92,93,102 103	6,53 57-61 73,74,97 101	15,64 84-86	12	105	9,13,14 66,67,87 88,90,94 104	1,16	96,98 99	52,79	95,100		17 54-56 65,82,91
#15-Bureau of Mines													1,2
#18-Colo. River Board		1,2											
#19-Roger Grette					1								
#20-Fish & Wildlife Serv.				1-9									
#21-Fed. Highway Admin.													1-4
#25-Nat. Res. Def. Coun.	2	3							5			4	1
#26-Geological Survey	1-7												
#28-National Park Serv.		16	13,15	5	1-4 6-12 17-22			14					
#29-Coast Guard		1											
#30-Health, Ed., and Welfare	2-7	14				1,8-13							15
#31-Env. Prot. Agency	1-6	7,9-14 20-27 30,31,39	8,15,16 36				35			18,19		17,32	28,29 33,34 37,38
#33-Bureau of Reclamation		2,3,11 16-19 23	4,6,21				15	12-14		20		7,25-27	1,5 8-10 22,24
#34-Health, Ed., and Welfare	6	1-3							4			5	
#35-Forest Service			4				1,2						3
#36-Fed. Energy Admin.		2,3								4		1	5
#38-Geological Survey	3,12	1,2,9,13 14,18 20-26 29,30	7,8,11				17					10,15,16	4-6 19,27 28
#40-Energy Res. & Dev. Admin.	2,9	3	1				10	4,5,12			6,7	8	11
#41-Colo. Div. of Water Res.		1-3										4	
#42-Colo. Div. of Wildlife			1,2	3,4									
#43-Colo. Geological Survey		2								1			
Totals of Comments	62	115	35	20	28	8	23	11	12	10	5	16	40
Percent of Total	16	30	9	5	7	2	6	3	3	3	1	4	11

\*-Comment Number

COMMENTS - GRAND TOTAL - 385

## CONSULTATION & COORDINATION

### INDIVIDUALS TESTIFYING AT HEARINGS

<u>Speaker</u>	<u>Representing</u>	<u>Location</u>	<u>Page Number</u>
L. Foy	La Sal Pipe Line Co.	Moab	X-13
L. Pierson	Self	Moab	X-14
D. Bradley	Self	Moab	X-15
D. Treadway	Self	Moab	X-16
R. Huff	Battlement Mesa, Inc.	Grand Jct.	X-17
D. McSparran	A.R. Co.	Grand Jct.	X-18
H. Dole	Colony	Denver	X-22
C. Johnson	Colo. Open Space Council	Denver	X-28
K. Fletcher	Environmental Defense Fund	Denver	X-29
A. Stokes	Sierra Club	Denver	X-30
D. Varisco	A.R. Co.	Denver	X-36
K. Markey	Friends of the Earth	Denver	X-37

## HEARING COMMENTS AND RESPONSES

L. Foy - La Sal Pipe Line Co. - Moab

1. Comment: One other thing in the Impact Statement was the -- I think it was stated that the revegetation would be cleared from the right-of-way and it so states in the technical specifications for the construction of the pipeline that the vegetation is not to be cleared from the right-of-way. We will run over a lot of it. We will clear some out of the ditchline where we are digging the ditch and there will be the only place that we will intend to move any vegetation.

Response: Text has been revised in Chapter II, Shale Oil Pipeline, and in Chapter IV, Soils, Vegetation.

2. Comment: The Draft Impact Statement should be appropriately revised to show the current right-of-way alignment and to discuss clearly whatever additional permits or amendments will be necessary to grant the request for additional width.

Response: The pipeline route is depicted in the statement as a corridor and because of the small scale, the exact center line survey is not shown. The Right-of-Way center line survey maps, are contained in the right-of-way application case file along with the amendment to change the pipeline routing from the old Dere Cabin plant site to the new Fugawee plant site. The request for additional right-of-way width in the East Salt Creek canyon area for construction purposes would be handled by a temporary Right-of-Way for the life of the construction period.

3. Comment: On Segment F where they suggested rerouting, there was evidently a misunderstanding in this area because, as the alignment sheets show and the technical specifications stipulate, we were going exactly where they suggested it be rerouted to through a deep cut out here north of Moab. I think it's south of the airport. So we are all in complete accord on this.

Response: The text has been revised in Chapter IX, Pipeline Routes, Moab Alternative.

L. Pierson - Self - Moab

1. Comment: The Spanish Trail, Fremont's Route, the old Moab-Thompson and Moab-Green River roads, the Mormon Dugway near Arches headquarters, the historic crossing of Colorado River at Moab, the kilns in Spanish Valley, Blue Hill, et cetera, all of which deserve consideration and none of which are even mentioned in the report.

Response: The text (Chapters III and IV, Cultural Values) has been revised to include the mention of these sites of historical interest.

2. Comment: The old Denver-Rio Grande narrow gauge road, railroad bed, is pictured in the report and will be crossed by the pipeline, but no evaluation of its historic importance nor any mitigation is offered in the report.

Response: The old Denver and Rio Grande Western Railroad narrow gauge grades occur in many places in eastern Utah and do not appear to be of great historic value in the area near Cisco where the proposed pipeline would cut across them as they are already cut badly by existing roads, Interstate 70, pipelines, and the standard gauge railroad. The text (Chapters III and IV, Cultural Values) has been expanded to include a discussion of this.

3. Comment: In my opinion, many of the above places are of state and local significance, one or two of national significance, and they should be discussed in this impact statement for even though they do not receive direct impact from the pipeline they will receive indirect impacts and the pipeline construction monitoring will pay no attention to these places unless they receive mention in the report.

Response: The text has been revised in Chapter III, IV, and V, Cultural Values.

4. Comment: Fossils too have received short shrift. For example, there are local reports of elephant finds in the Valley City Reservoir area and there is an excellent deposit of limestone containing a myriad of fossils across from the Arches Visitor Center on the pipeline route that receives no comment or analysis. Similarly, Blue Hill is reported to contain dinosaur fossils.

Response: There is little published information regarding fossils in the area of the pipeline route. The draft statement identified formations where occurrence of fossils could be possible. A complete cultural survey will have to be done for the entire pipeline route before a right-of-way could be granted.

5. Comment: Colony's mitigation measures are totally inadequate. Those added by the BLM are adequate but not complete. The BLM must leave itself the option of directing the pipeline company to move its line when important or significant cultural resources are found either on the surface or in the trench, when these cultural resources are deemed important enough to preserve for the future and not be completely or even partially salvaged at this time.

Response: The BLM does have and will exercise the option of requiring the pipeline company to move the line if significant cultural resources are found prior to or during construction activities. If cultural remains are discovered during construction, all construction will cease until the findings are properly evaluated and a decision is made to re-route or use salvage operations. These are stipulations that will be made a part of any right-of-way grant issued. The text in Chapter V (Cultural Values) has been revised to show this.

D. Bradley - Self - Moab

Comment: I am in question as to the efficiency of the difference between having the pipeline and having a railway transmit the oil shale. I think that there were two opinions in your report as to the conservation of energy.

Your report said, BLM report said, that it was more conservative as far as energy goes for the pipeline, and another report said that it was more conservative if you use railway. And I am in question as to which is more efficient and which is more conservative.

Response: Another report was obtained but still does not solve the problem. The text has been revised in Chapter IX, Transportation Modes.

D. Treadway - Self - Moab

1. Comment: Also I question the validity of the Impact Statement in regards to toxic emittance into waterways and a lack of measures for such toxins.

Response: Although precise measurements of toxic releases to ground and surface water regimes are not available in the absence of an operating shale oil complex, studies have been conducted to attempt to approximate the levels of these emissions. Recently completed studies by Metcalf and Eddy have provided more detailed evaluation and added quantification for the effects of the proposed shale oil complex upon water quality. The text in Chapter IV, Water Quality of Davis Gulch, have been extensively revised to incorporate these studies.

2. Comment: The EIS offers no remedies to the increases of dissolved heavy metals and other pollutants from other waste products to be disposed of in the shale embankment which will occur in run off waters. Such waters certainly won't prove beneficial to any aquatic plant life and wildlife downstream from the plant.

Response: The purpose of an EIS is to analyze the proposal and it's environmental impacts. Remedies are contained in Chapter V - Mitigating Measures. Mitigating Measures explored are those that are technically feasible.

3. Comment: No solutions were set forth to safeguard water plants or wildlife should any toxic chemical be carried into the stream and river from the plant operation and is explained simply as a matter of fact. These would most certainly have a perceptible effect on all fish and animal life.

Response: As described in Chapter V under Water Resources, various laws and regulations are cited. If these requirements are met, adequate mitigation will be realized. In the event the requirements aren't met, the impacts that would occur are analyzed in Chapter IV under Water Quality.

4. Comment: On the whole, the Environmental Impact Statement mentions many variables that will be adversely affected by the plant site development in Parachute Creek, Colorado. However, the Impact Statement lacks the necessary depth in offering what I feel are necessary safeguards and at times simply offers none at all.

Response: The purpose of an EIS is to analyze the impacts within the framework of existing laws and regulations. Since the plant, mine, service corridor, and Grand Valley terminal are on private land there are only a few regulations and laws that apply. The applicable laws and regulations are discussed in Chapter V. Colony is only obligated to follow those existing, applicable laws and regulations.

5. Comment: The Impact Statement contains many unknowns such as the concentrations of metallic elements that can be expected and run off from the oil shale operation.

Response: In a new industry many items will remain unknown until actual production is instituted. Monitoring by Colony and appropriate regulatory agencies will provide concentrations of metals, air pollution, etc.

R. Huff - Battlement Mesa Inc. - Grand Junction

1. Comment: For example, it says 28 acres is required for each housing unit needed to meet the increased demand. In fact, only 0.28 acres, or about an acre per housing unit, are projected as necessary.

Response: The table has been revised to correct the omission of the decimal point.

2. Comment: There is insufficient reference to the funding gaps which the impacted communities must bridge to pay the initial capital costs of physical and social amenities and services. Perhaps an analysis of this impact and the myriad mitigating options available might be included in the final EIS.

Response: Estimates of site requirements and costs are shown in Table IV-39. While the costs shown are in 1970-72 dollars, BLM believes that they are representative of the costs associated with the proposed Colony Oil Shale operation.

D. McSparran - A.R.Co. - Grand Junction

1. Comment: On Page II-5, the statement is made that Colony's diversion of 12.5 c.f.s. of water for the operation of the shale oil plant and related facilities is contingent upon the proposed contract with the Bureau of Reclamation. This conclusion is somewhat misleading.

Response: The text has been revised in Chapter II, Description of the Proposed Action, to reflect 7,200 acre feet rather than 12.5 cfs.

2. Comment: Consistent with Colony's anticipated plans, the negotiation and execution of this contract by the Bureau of Reclamation should be identified as one of the Federal actions which will be required if the Colony project is implemented. The proposed Ruedi contract should be treated in the same manner as the Green Mountain contract, including a full discussion of the impacts which may result from Colony's intended consumption of water from this source.

Response: A contract for water from Ruedi Reservoir cannot be consummated until a water marketing policy is formulated. Latest information provides that the policy has not been formulated and no date, for the policy has been set. Therefore due to the uncertainty of the policy the contract is not discussed in Chapter II. Ruedi Reservoir is discussed in Chapter IX, Water Sources. Impacts related to this contract will be assessed by the Bureau of Reclamation when, and if, it is executed.

3. Comment: Throughout the document there are statements to the effect that the project will dry up the springs in Middle Fork and Davis Gulch and will greatly reduce the flow of Parachute Creek due to dams constructed on Davis Gulch and Middle Fork. I wish to point out that most of Colony's water rights on Parachute Creek have relatively junior priorities. Therefore, we will not be allowed to reduce the flow of Parachute Creek to the extent that senior downstream water users would be deprived of their normal diversions of water.

Response: Colony has stated that water releases from the Colorado River pipeline will be made to protect stream water rights. The text has been revised to reflect this release. See Chapter II, Water Supply, Chapter IV, Water Resources, Surface Hydrology, and Chapter V, Water Resources, Colony's Commitments.

4. Comment: Concerning the matter of drying up the springs, statements are made that Colony will remove the aquitard by mining the Mahogany zone, thereby dewatering the overlying sediments and causing the springs to dry up. We will be removing only a portion of the Mahogany zone; therefore, the remaining part of the Mahogany and many other overlying aquitards will still serve to restrict the downward flow of water. Although there could be some reduction in spring flow from our other activities, I feel that the mining will not have a significant effect on the springs.

Response: A study conducted by Metcalf & Eddy for Colony indicates that, "groundwater table is expected to be lowered throughout the property to a maximum elevation of the mine floor, or about 7,070 feet." Any spring receiving water from an aquifer at any elevation of or above 7,070 feet will be dried up, see text change in Chapter IV, Water Resources, Subsurface Hydrology.

5. Comment: In the analysis of impacts upon water quality resulting from the construction of the processed shale embankment, references are made to the lack of data regarding the characteristics of runoff and leachate from processed shale.

Metcalf & Eddy, acting as a consultant for Colony, has recently completed a report analyzing the results of a series of controlled experiments intended to examine this problem in greater detail. The study is being made available to the BLM in the hope that it will be useful in developing more definitive conclusions in the final statement about the processed shale embankment.

Response: The text has been revised in the Water Quality portion of Water Resources section of Chapter IV. in accordance with data presented in this recent study (October, 1975) by Metcalf and Eddy: Water Pollution Potential from Surface Disposal of Processed Oil Shale from the TOSCO II Process (2 vols.).

6. Comment: At the beginning of Chapter VI, the projected water consumption is given as 12.5 cfs from the Colorado River with an additional reduced flow of 0.5 cfs from Parachute Creek. These two numbers are not additive. Any reduced flow from Parachute Creek will be made up from the 12.5 cfs.

Also, it is stated that this amount of flow would reduce the annual flow of the river by 3,659 cfs. We believe that the writers intended to say that the average annual flow of the water is 3,659 cfs and that flow will be reduced by 12.5 cfs as a result of Colony's operation.

Response: The text has been revised in Chapter VI, Water Resources.

7. Comment: In several places in the statement, and specifically on Page VI-12, it is stated that the Middle Fork Dam will reduce the beneficial silt flushing in Parachute Creek. It should be noted that except for its temporary dead storage capacity of 200 acre feet, the Middle Fork Dam will automatically allow up to 400 cfs to pass through an outlet.

Although the structure will serve to reduce the destructive effects of extremely high runoff events, it should not interfere with the beneficial flushing effects of seasonal runoff which is normally far below this 400 cfs flow-through capacity.

Response: It is implied here that 400 cfs will be flowing through with some regularity, seldom does Middle Fork carry this amount of water. The 300 acre feet of dead storage will act as a settling pond if nothing else and slow flow downstream. The DES does not say the structure will eliminate, only 'reduce' silt flushing. Note, the 200 acre feet referred to in the comment should read 300 acre feet.

8. Comment: I also feel that the beneficial impacts from the project are not given proper recognition. For instance, the release of water from Green Mountain will occur during periods of low flow and thus will enhance the quality of the river. I find only one small reference to this beneficial impact on Page IV-88.

Response: It is rather doubtful that the release from Green Mountain will produce any measurable benefits, being such a low percentage of the average flow even during record low of 80 cfs it would only be 16 percent. Also low flows are during the winter when little use is made below the reservoir other than to maintain aquatic habitants.

H. Dole - Colony - Denver

1. Comment: Considering the improbability of the simultaneous failure of the Davis Gulch Dam and Middle Fork Dam, for example, this statement includes an inordinate amount of negative conjecture about the environmental impacts of such an event compared to the degree of attention paid to the impacts which are expected to result from normal operations as planned by Colony.

Response: When the probability of an event occurring, or quantities of a pollutant, are unknown it is BLM procedure to analyze the "worst case". In Chapter IV, Dam Failure, the event of both dams failing simultaneously was introduced as being remote. In other cases where the "worst case" was analyzed, BLM attempted to caution readers that this case was not probable, but was the maximum impact.

This "worst case" is important to the decisionmaker. He needs to know what the maximum impacts of the proposal could be, if implemented.

2. Comment: In at least two sections the statement suggests that severely negative socio-economic impacts, such as prostitution and alcoholism, will inevitably result from the construction and operation of the plant. A more balanced analysis would include references to the fact that this area of the state is not without serious socio-economic problems at the present time and that the Colony project is just as likely to produce substantial socio-economic benefits for local communities. Although the apparent negative bias may have been unintended, we hope that the final statement will be more objective in its conclusions.

Response: The text states that these events could occur. The positive impacts, i.e. income and tax base expansion, are discussed in Chapter IV, Local Tax Base and Infrastructure.

3. Comment: Certain other of the cumulative impacts of the project as stated in the Draft deserve qualification. Repeated reference is made to the substantial impact of the project on local populations of elk, mountain lion, black bear, golden eagles, and wild horses. The statement fails to note that, with the exception of elk, confirmed sightings of these species in the areas to be affected by the plant and service corridor have been extremely limited in recent years.

To the extent that the local disappearance of these species is due to increases in population and related development, further reductions are likely to occur regardless of whether the Colony plant is built. In this context, the additional impact attributable to the Colony plant may be less significant than indicated.

Response: In the analysis of impacts on elk, mountain lion, bear, and eagles we discussed only feasible Colony - induced impacts. It is agreed that the populations could be reduced without the Colony operation. This is explored in Chapter III, Probable Future Environment Without the Proposal. It is difficult to project impacts in an area that has not experienced any industrialization.

4. Comment: The Draft contains several erroneous statements; for example, Page II-23 regarding the sulfur content of the product oil which Colony proposes to transport to market by pipeline. Crude shale oil contains approximately 0.8 percent sulfur, but the Colony design includes hydro-treating facilities which will reduce sulfur content to approximately 0.001 weight percent, thus making available a premium fuel to be burned in air sheds now having sulfur oxide problems.

Response: Colony confirmed this oral testimony by written communication on August 3, 1976. The text has been revised in the section on Retorting and Upgrading in Chapter II to indicate the product oil will contain approximately 0.001 weight percent sulfur.

5. Comment: Colony has supplied estimates of air contaminant emissions for full scale operations and average operations. The latter reflects that portions of the complex will be routinely shut down for maintenance and, consequently, fuel consumption will vary. In some cases, the Draft has inappropriately converted maximum hourly emission rates; that is, those resulting from full scale operations, to a yearly basis with the result that tabulated yearly emission rates are too high.

Response: The text has been revised in the Plant Start-Up and Operation section of Chapter II to explain how the maximum yearly emission rates were derived and their resulting higher levels than could actually be expected.

6. Comment: The Draft has also attempted to evaluate a hypothetical air pollution episode in the upper reaches of Parachute Creek by adding together the worst case results from several diffusion modeling studies. These worst case results are not additive because they would not occur under the same meteorological conditions and because the sources considered in the various studies are in different locations.

Response: The text has been revised in the section on Air Quality in the Parachute Creek valley in Chapter IV to indicate that meteorological conditions in the valley and plateau may not be simultaneously conducive to produce a worst case situation. The low confidence level of the resulting data from the diffusion model studies and the possible invalidity of the methods used for combining the results of these studies in Table IV-9 are also stated in revisions in Chapter IV.

7. Comment: In evaluating computer predictions of three-hour and 24-hour maximum short-term air contaminant concentrations, the Draft has not accounted for the fact that meteorological data were not available for a full 365-day year. While it is accurate that data were obtained for 12 calendar months and resulting projections of annual average ambient concentrations should be reasonably reliable, inevitably meteorological data losses did occur in the collection of the data. In predicting the number of days or hours per day that a given concentration might be exceeded, it is consequently necessary to normalize the computer projections in order to accommodate the omissions.

Response: The text has been revised in Chapter IV, Climate and Air Quality, to indicate that the Battelle data (Table IV-3) has been normalized and why it was necessary.

8. Comment: In evaluating Colony's ability to comply with state ambient air quality standards, the Draft suffers from two additional shortcomings. First, it has failed to note that Colorado has only recently revised its standards for sulfur dioxide. The new standards are slightly different than those addressed in the Draft.

Response: The text and Table IV-5 have been revised in Chapter IV, Climate and Air Quality, to show the current ambient air quality standards for the State of Colorado.

9. Comment: Second, and noted in correspondence with the BLM, various mitigating measures, such as fuel-switching or curtailment of operations, are available if necessary to insure compliance with short-term ambient air quality standards. Procedures of this type have been successfully used at various industrial sites throughout the United States.

Response: A commitment by Colony to this effect, stated above, has been added to Chapter V in Colony's Commitments in the Air section.

10. Comment: There may be insurmountable technical problems with the development of long-wall equipment for oil shale. The discussion of long-wall and long-hole blasting methods suggests that recovery percentages of 100 per cent can be attained by these methods. Due to the necessity of development work and the barrier pillars, overall recovery would probably be limited to 80 to 90 per cent even with recovery in the panel or stope at 100 per cent.

Response: The text has been revised in Chapter IX, Mining Methods.

11. Comment: The method described as long-hole blasting in the Draft should be actually referred to as sub-level stoping with long-hole blasting being only one of several blasting techniques feasible with this method. The Draft's judgment about the greater safety of sub-level versus room and pillar mining is unproven and no sound basis for the judgment will exist until mines of each type are used for the recovery of oil shale.

Response: The text has been revised in Chapter IX, Mining Methods.

12. Comment: The understatement of the impacts which could result from in situ processing is quite misleading. The Draft's conclusion that air emissions from this recovery method would be limited to construction and mining activity completely ignores the serious problem of the treatment and disposal of combustion gases generated by underground retorting, including substantial quantities of sulfur oxides.

Response: The portion on In Situ Processing in the Mining Methods section of Chapter IX has been extensively revised. The existence and treatment of combustion gases are mentioned under Impacts for this method.

13. Comment: The discussion also fails to note that operating facilities and related emissions will inevitably be required before the crude shale oil produced by this method can be efficiently transported or used in market areas subject to stringent air quality controls. Water requirements are substantial no matter where upgrading facilities are.

Response: Only the impacts of the in situ mining and retorting processes are described in the Mining Methods section in Chapter IX. Upgrading facilities and their requirements are not considered.

14. Comment: It should also be noted that the discussion fails to distinguish between the in situ and modified in situ methods. The modified in situ process would require considerable underground mining activity and it is not possible in the absence of further experience with commercial scale chimneys to make any predictions at this time about the degree of subsidence that might be expected.

Response: The portion on In Situ Processing in the Mining Methods section of Chapter IX has been extensively revised to express the methods and impacts of in situ and modified in situ processing.

15. Comment: In addition, if upgrading facilities and equivalent production rates of the modified in situ process are considered, the difference in the number of employees required, as compared to the room and pillar method combined with the TOSCO II retorting process, may not be as great as implied.

Response: Only the employment related to the in situ mining and retorting processes are considered in the revised portion on In Situ Processing in the Mining Methods section of Chapter IX. Employment at upgrading facilities are not considered.

C. Johnson - Colorado Open Space Council - Denver

1. Comment: The Colony application to the U.S. Bureau of Reclamation for 12.5 cfs of water from Green Mountain Reservoir surprised us. For the last five years Colony has stated to us that it has firm, private water rights. As a result of this we think it is necessary to present information on their water rights, both as a consortium and as separate corporate entities, and to include a comparison of the various costs of different alternatives to the government.

Response: The Water Supply Section in Chapter II and Chapter III, Mine and Plant Site, Hydrology, point out that Colony has junior or recent water rights to natural flow of the river, the priority date being 1957. The costs, to the Government, of the various alternatives is minimal and large differences can be found at the present.

2. Comment: The section on mitigating measures very nicely separates the legal requirements from Colony's commitments, but we strongly feel that BLM has the responsibility to set its own requirements on the plant, mine, and new town, and any other developments, should the project be revived.

Response: The BLM has taken the position that it does not have the authority to set requirements on Colony's private lands, especially since there are governmental entities with these responsibilities and authority. The Federal and State agencies concerned are outlined in Chapter V.

3. Comment: BLM has a clear responsibility as the lead agency to present requirements on the core projects and it is not fulfilling this responsibility by relying on the proponent's commitments and the agency's stipulations on pipeline construction and operation. The agency requirements could be substantially different and far more stringent in protecting the environment than the proponent's initial design and at least this would give a minimum assurance to the public.

Response: The Federal, State, and local requirements, mitigating measures, are clearly spelled out after each section in Chapter V, i.e. vegetation, soil, and water. BLM is one of the Federal agencies responsible for these requirements.

K. Fletcher - Environmental Defense Fund - Denver

1. Comment: In particular, the cumulative impacts of multiple projects in the area are key to determining the desirability of oil shale development in northwest Colorado. Without knowing when this project might or might not occur, it is impossible to determine its relationship to other potential projects in the same area. Cumulative impacts are purely a function of timing.

Response: The relative position of the Colony operation in the overall oil shale picture can be derived by referring to the USDI Final Environmental Statement for the Prototype Oil Shale Leasing Program, 1973.

## CONSULTATION & COORDINATION

2. Comment: In addition, it is impossible to explore the alternatives to a proposed action without knowing when it might take place. Certainly the alternatives to a commercial oil shale plant in 1976 might be quite different from the alternatives to the same action in 1980, 1985 or 1990. To prepare an Environmental Impact Statement in the absence of a proposed timetable, indeed in the absence of sponsors who feel the project is viable, is to make a farce of the NEPA process.

Response: If, and when, Colony activates its time schedule, the EIS will be analyzed. If significant changes in the proposal have been made which would change the impact analysis, then a supplement would be issued at that time. This EIS will be timely for the land exchange, if implemented prior to plant or pipeline construction.

### A. Stokes - Sierra Club - Denver

1. Comment: If Colony keeps its project on the back burner until other plants are operating, the socio-economic impacts should properly be analyzed as a cumulative impact rather than as the result of an initial population burst. Adding several thousands to an already greatly increased local and regional population would be different than if Colony were to cause the first influx.

Response: See response to K. Fletcher - Environmental Defense Fund - Denver comment number 2.

2. Comment: Likewise, in determining whether Colony can meet ambient air standards it is essential to note the existing pollution levels. If other oil shale plants are polluting the air before Colony builds, the Colony Plant may be the straw that would put the region's air over the ambient standards.

Response: Regional impacts are analyzed in the USDI Final Environmental Statement for the Prototype Oil Shale Leasing Program, 1973. Colony is the first specific proposal to be made in the region and is analyzed in this statement for site specific impacts. Additional proposals will be analyzed as they are received for site specific impacts in the context of the regional environment as it is affected by existing developments.

3. Comment: The Draft Statement is totally inadequate in assuring that adequate revegetation efforts will be undertaken and that they will be successful. The club is not convinced by the Draft Statement that any revegetation experiments have shown that revegetation of the spent shale piles is possible without use of topsoil. Nevertheless, the statement at II-62 states that only 200 of the 800 acres of the area needed to be rehabilitated will be covered with topsoil and this is the only amount of topsoil available in the area.

It is reckless and in disregard to environmental consequences to state that revegetation may be attempted on the processed shale pile without topsoil. The statement notes that six inches of topsoil will be used along with various amounts of phosphorus and nitrogen per acre. Nevertheless, there is nothing in the statement to indicate that these aren't arbitrary because they aren't accompanied by references to studies.

Response: Recent studies have shown that processed shale can be revegetated without topsoil. Also, three inches of soil have produced comparable results with six inches of soil. The references for these studies are included in Colony's EIA, Part I. More recent studies are as follows: Harbert and Berg, Progress Report of 1975 Results, Vegetative Stabilization of Spent Oil Shales, 1975. Aitken, Processed Shale Revegetation, 1976. Harbert and Berg, Vegetative Stabilization Of Spent Oil Shales, Tech. Report No. 4, 1974.

4. Comment: Also quite disturbing is the statement at II-65 that the best seeding mixture and density for use in the revegetation programs is not known but that experiments to determine the best mixtures will continue while revegetation is going on.

Response: This is normal practice when changing from experimental plots to large scale seedings. The seed source, fertilizer source, weather, etc., all may change the results and the revegetation plan must remain flexible.

5. Comment: It is all well and fine to gloss over the revegetation efforts to be undertaken by Colony and for BLM to state that they will be undertaken, but to fully protect the environment the permit to Colony, if granted, must contain stipulations which bind Colony to this grandiose revegetation scheme.

Response: See response to C. Johnson - Colorado Open Space Council - Denver Comment #2.

6. Comment: What assurance does the public have that considering the high cost of developing an oil shale plant that the money won't simply run out when it comes to revegetation efforts? Will not such highly necessary and commendable efforts be regarded as a luxury? Permit stipulations concerning revegetation should provide as follows:

The entire spent shale pile and other areas needed to be revegetated should be covered with topsoil to the depth shown to be needed by studies and required for revegetation of the native species in the quantity existing prior to disturbance.

Adequate amounts of fertilizer and water should be used. And speaking of water, it is important I think to somehow create a supply of water in escrow, so to speak, so that water will be guaranteed in possibly a water-short situation.

Response: Colony has stated as much in their maintenance statement in Chapter II. The water situation has been studied and this is the reason Colony has requested water from Green Mountain and Reudi reservoirs.

7. Comment: Air quality. The analysis of air quality impacts is defective in that the analysis of one the most significant pollutants, sulfur dioxide, is based upon Colorado standards which have been superseded. The ambient air standards for Colorado, listed on Page IV-30, have been replaced by those listed in the attachment to this statement marked Exhibit A. These standards were recently changed but you should be made aware of them.

Response: See response to H. Dole - Colony - Denver, comment #8.

8. Comment: The existing SO<sub>2</sub> levels are only 0.572 micrograms per cubic meter. I might add here I wonder maybe the decimal point isn't off in that statement and the levels were higher. This is an extremely low level and thus, for all practical purposes, the expected SO<sub>2</sub> ambient standard concentrations can be treated as increments.

Response: The theoretical ambient concentrations of pollutants derived by Dames and Moore in Table III-1 have been abandoned and more applicable data have been used from the first year of environmental baseline studies on Oil Shale Tract C-b. The average ambient SO<sub>2</sub> concentration for the area, shown in Table III-30 in the Mine and Plant Site portion of the Air Quality section of Chapter III, was increased to 1.0  $\mu\text{gm}/\text{m}^3$  (approximately 0.4 ppb). This concentration is at the lower end of global-average, background concentrations of SO<sub>2</sub> of between 1 and 4  $\mu\text{gm}/\text{m}^3$ .

9. Comment: It is absolutely unconscionable for the Bureau of Land Management to issue a pipeline right-of-way to Colony when predictions indicate that the plant will violate SO<sub>2</sub> standards. It is standard for the Department of Interior to include in permits such as this one provisions that all State and Federal laws will be complied with and to issue such a permit with such language really makes the conditions meaningless in view of predicted violations.

Response: If a violation is detected after plant operation begins, the appropriate penalties will be enforced by the appropriate agency. The penalties could range from a fine to plant shut-down. The reader is cautioned to realize that a possible violation of SO<sub>2</sub> standards is a prediction. Actual emissions will be monitored and it is possible that the emissions will be well below the applicable standards. Chapter V, Air, contains the applicable laws and mitigating measures.

10. Comment: In light of the predicted violation of SO<sub>2</sub> standards, the Draft EIS is deficient in not examining emission control equipment which could bring emissions down so that ambient standards would not be violated. Such technology should have been fully examined, including the possibilities of installing SO<sub>2</sub> scrubbers now in extensive use on the coal-fired power plants. These scrubbers which now remove up to 90 per cent of the SO<sub>2</sub> from power plant flue gases, if capable of being installed on the oil shale plant, might allow ambient standards to be met.

Response: Colony has made the commitment in Chapter V that it should be able to avoid actual violations of the State's incremental SO<sub>2</sub> standards by curtailing operations or by burning hydrotreated shale oil (fuel oil) as plant fuel. Sulfur removal is discussed in Chapter II (Claus Sulfur Recovery Unit and the tail gas unit, using the Wellman-Lord SO<sub>2</sub> Recovery Process). As stated in revisions in Colony's Commitments in the Air section of Chapter V, flue-gas desulfurization was considered by Colony and judged to be more expensive and less reliable than the use of hydrotreated fuels.

11. Comment: Maintenance of Davis Gulch catchment dam. One of the many loose ends of Colony's project is the fate of the Davis Gulch Dam. Apparently Colony had not decided what to do with this explosive time bomb. Colony has certainly not committed itself to maintaining the dam in perpetuity.

Nevertheless, provisions must be made for preventing the dam from spilling since there is the possibility that sudden failure could occur releasing 1,200 acre feet of water to rush rapidly down Parachute Creek and flood the town of Grand Valley causing much loss of property and possibly lives. Thus, if the dam is to be left, Colony should be committed to maintaining the dam in perpetuity as long as a flood danger exists.

Response: Refer to Colony's maintenance commitment in Chapter II, Solid Waste Disposal.

12. Comment: Second alternative: Use of unit trains to transport shale oil.

This offers a great deal of flexibility which the pipeline would not. Oil could be transported from the retort to the railhead by the pipeline down Parachute Creek. The environmental aspect of this pipeline should be more carefully examined if BLM gives serious attention to the unit alternative.

Response: The impacts are analyzed in Chapter IX, Transportation Modes. When analyzing impacts of an alternative only differences between the alternative and the proposed action are analyzed in depth. The impacts of a pipeline (water and ammonia) are analyzed in Chapter IV.

13. Comment: This unit train alternative might also conserve energy. The Rand study indicates that rail transport uses less than half the energy that a pipeline system would. One of Colony's consultants indicates that to the contrary, a rail system would use about 50 per cent more energy than the pipeline.

Unfortunately, the Draft Statement does not attempt to resolve the disparity between the two estimates on energy effectiveness. This is critical. The air pollution effects of diesel emissions from the unit train would be insignificant spread out over 194 miles.

Response: See response to D. Bradley - Moab.

14. Comment: The other possibility is to remove the dam after the oil shale mining is complete. On this horn of the dilemma, however, extensive leaching problems would occur and consequent water pollution of Parachute Creek and the Colorado River would result. The fate of the catchment dam should be resolved prior to issuance of a permit.

Response: Refer to Colony's maintenance commitment in Chapter II, Solid Waste Disposal.

D. Varisco - A.R.Co. - Denver

1. Comment: Any comparison between shale oil and coal must consider transportation energy requirements which are dramatically higher for solids compared to liquids.

Response: As discussed in Chapter VIII, Energy Output-Input Ratios, energy requirements for transportation were not considered in any of the alternatives.

2. Comment: Furthermore, the comparison of fully refined high-quality shale oil to bituminous coal which commonly contains sulfur concentrations of two to five weight per cent is misleading. The energy losses associated with the sulfur removal step that is required to make these energy sources environmentally acceptable should be considered.

If a liquification step is necessary to meet the sulfur requirements for certain markets, the 60 to 70 percent thermal efficiency of this step would reduce the net energy ratio for this resource to a maximum of 2.3. This compares to the ratios of 189.8 to 197.9 shown in Table VIII-4.

Response: Data is not available for the energy inputs for desulfurization of power plant effluent gases. See text changes in Chapter VIII, Energy Output-Input Ratios.

K. Markey - Friends of the Earth - Denver

Comment: This situation is exacerbated by the limited scope of the Environmental Impact Statement not taking into account cumulative socio-economic impacts.

Response: The scope of this EIS was assigned as site-specific. Cumulative impacts of an oil shale industry in the Piceance Creek Basin are addressed in the USDI Final Environmental Statement for the Prototype Oil Shale Leasing Program, 1973.

#### WRITTEN COMMENTS AND RESPONSES

All letters received from individuals plus those received from all agency heads were numbered chronologically. The EIS Team analyzed each letter and responded to all comments that dealt with the adequacy of the statement. All numbered letters are reproduced here. Editorial comments that refer to the Oil Spill Contingency Plan (Appendix 1) were forwarded to Colony.

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## Letters Received

<u>Letter Number</u>	<u>Agency, Organization or Individual</u>	<u>Page Number</u>
4.	F. M. Stevenson	X- 39
5.	Soil Conservation Service	X- 39
7.	Colorado Department of Health	X- 40
8.	State Historical Society of Colorado	X- 41
9.	Izaak Walton League	X- 43
10.	L. L. Ludlam	X- 44
12.	Allied Chemical	X- 45
13.	Corps of Engineers	X- 45
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15.	U.S. Bureau of Mines	X- 81
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20.	U.S. Fish and Wildlife Service	X- 84
21.	Federal Highway Administration	X- 86
25.	Natural Resources Defense Council, Inc	X- 88
26.	U.S. Geological Survey	X- 90
28.	National Park Service	X- 94
29.	U.S. Coast Guard	X- 101
30.	U.S. Department of Health, Education & Welfare	X- 101
31.	Environmental Protection Agency	X- 105
33.	U.S. Bureau of Reclamation	X- 123
34.	U.S. Department of Health, Education & Welfare	X- 131
35.	U.S. Forest Service	X- 134
36.	U.S. Federal Energy Administration	X- 135
38.	U.S. Geological Survey	X- 136
40.	U.S. Energy Research & Development Administration	X- 146
41.	Colorado Division of Water Resources	X- 151
42.	Colorado Division of Wildlife	X- 152
43.	Colorado Geological Survey	X- 154

4. F.M. Stevenson - Self

Comment: No long-term declared damage to wildlife, fish, or birds is found by the study.

Response: See Chapter VI where numerous adverse effects, which cannot be avoided, were enumerated.

5. Soil Conservation Service

1. Comment: It is not clear why only 200 acres of the 800 acres covered by the processed shale disposal and Davis Gulch Catchment Dam will be stockpiled and respread on the surface. Apparently, the remaining 600 acres of topsoil will not be utilized.

Response: All of the topsoil, will be stockpiled. Due to the planned undulating surface of the completed processed shale pile there would not be enough soil to cover the entire shale pile to a depth of six inches.

2. Comment: There do not seem to be sufficient provisions for controlling erosion during construction.

Response: Erosion control is outlined in Chapter V. The BLM does not have jurisdiction on private land but Colony has committed itself to take reasonable precautions. The only controls are the state standards on water quality. This is the only definite control procedure concerning erosion.

7. Colorado Department of Health

1. Comment: An appropriate control plan should be implemented to reduce the impact from fugitive dust emissions during construction. Air Pollution Control Commission Regulation No. 1 should be reviewed for applicability to this project regarding fugitive dust.

Response: Since the Dow West property is private land, the BLM does not have the option of requiring a control plan for fugitive dust emissions from construction on the Dow West property. Colony's proposals and commitments are stated and their impacts are evaluated. Applicable Federal and State regulations pertaining to the proposed action are stated in Chapter V. The recently revised "Regulation No. 1" of the Colorado Air Pollution Control Commission further defines requirements for fugitive dust emissions. This regulation is summarized in the revised Federal, State, and Local Requirements portion of the Air section of Chapter V.

2. Comment: The reflection of noise off the canyon walls, added to noise levels of the plant, adds to the undesirability of locating the plant at the canyon bottom site.

Response: Unstable cliff blocks occur on the canyon slopes of the upper Middle Fork of Parachute Creek. Noise and vibration from construction of the mine bench and associated roads would add to the probability of rock slides, and could dislodge the unstable cliff blocks. The text has been revised in Chapter IV, Sound Levels, to indicate these possible impacts due to noise and vibration.

3. Comment: There is a naturally high ambient background for hydrocarbons already in existence. Any additional emissions of this pollutant will exaggerate violations of this standard.

Response: The estimated annual average ambient nonmethane hydrocarbon concentration for the area is  $130 \text{ ug/m}^3$ . This is near the Federal primary and secondary standards for ambient air quality which allow a concentration of greater than  $160 \text{ ug/m}^3$  for 3 hours from 6 to 9 A.M. for only once per year. Although there are no State of Colorado or Federal standards for total hydrocarbon concentrations it is anticipated that the Federal standards for nonmethane hydrocarbons may be exceeded several times per year, judging from the predicted increases for total hydrocarbons (of which nonmethane hydrocarbons are a part). The text has been revised in the portion on Total Hydrocarbons in the Climate and Air Quality section of the Dow West property in Chapter IV to raise this possibility.

#### 8. State Historical Society of Colorado

1. Comment: The proposed pipeline does cross the Dominguez-Escalante Trail at the approximate juncture of the Rio Blanco and Garfield county lines. Therefore, there will be an impact upon this trail. The Dominguez-Escalante Route is eligible for nomination as a National Register Trail and a Governor's Commission is working with this.

Response: The text (Chapter III, Cultural Values) has been revised to include this.

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2. Comment: The pipeline also crosses the Old Uintah Railroad grade at West Salt Creek. This railroad grade, with its definite historical significance, may also be eligible for National Register nomination and would be impacted by the pipeline.

Response: The text (Chapter III and IV, Cultural Values) has been revised and expanded to include a discussion of this.

3. Comment: The State of Colorado's inventory of historic and archaeological sites is an ongoing project and work in Garfield and Rio Blanco counties is not complete. A complete inventory of the project area by a qualified historian and an archaeologist is necessary before a realistic assessment of impacts can be made, and certainly prior to any clearance by this office. This inventory should include photographic records of historical sites and structures and all historic research data available. The information supplied by a complete inventory is invaluable in determining impacts to the region by such a large and complex undertaking as the Colony Development Operation.

Response: This was covered under the survey conducted by Dr. Calvin H. Jennings under contract with Colony Development Operation. The text (Chapter III and IV, Cultural Values) has been expanded to include the results.

4. Comment: An impact study requires adequate study of the resources in the area. Obviously this includes their identification. Therefore, I am afraid you will have to provide for a survey of the cultural resources for the plant site, service corridor, staging area, new town, and shale disposal area. We look forward to working with you on this this, as well as on the matter of the eligible National Register sites already identified.

Response: This has been completed under the survey conducted by Dr. Calvin H. Jennings under contract with Colony Development Operation. The text (Chapter III and IV, Cultural Values) has been expanded to include the results.

9. Izaak Walton League

Comment: DES refers to truck transportation from plant to rail head (15 miles ) if rail transportation is used. This, in our opinion is undesirable and unnecessary from both an economic and environmental standpoint. It seems obvious that a short 15 mile pipeline from plant to rail head would be acceptable, and an advantage for these reasons:

- a. Such 15 mile down hill pipeline would be on private property already owned by the developers.
- b. The developers already have a proposal pending to build two pipelines down the valley corridor (one for ammonia and one for sulfur) . Another pipeline to a tank farm from which the rail cars would be loaded , should be no material problem .
- c. Air quality in the narrow valley corridor already in heavy use, would be further adversely affected by such heavy truck traffic but not be a third pipeline (with two others) this short distance.

Response: These alternatives and their impacts were presented in Chapter IX, Transportation Modes .

10. L.L. Ludlam - Self

1. Comment: In Table IV-1, page IV-2, the impact of shale oil production on energy supply is classified as negligible. I strongly suggest that this be changed to "moderate" for the following reasons.

Shale oil production at 47,000 barrels per day represents roughly 10 percent of the total petroleum refinery input in the Rocky Mountain States (Ref. The Oil and Gas Journal API Refinery Report) and 1 percent of the total foreign crude imports into the U.S. Also, operation of a single, full-scale commercial oil shale plant represents available technology for recovering about 80 billion of the 600 billion barrels of crude oil equivalent in the Green River Formation (Draft EIS, page III-15).

Response: The table in Chapter IV has been revised.

2. Comment: The Draft EIS adequately covers the raw data concerning socio-economic conditions in Mesa, Garfield, and Rio Blanco counties, but underestimates the potential benefit of major industrial development in this area. Out-migration of residents in the 19-29 year age bracket, higher than State average percentages of population on welfare, lower wage rates, and higher unemployment all point to an undesirable situation.

Response: Table III-23 indicates that the Five-County region welfare population is 6.06 percent of the total versus 9.3 percent for the state.

Personal income is lower for the region than for the state. The percent of the population below the poverty level is about equal to the state. Unemployment was 5.4 percent for the region versus 4 percent for the state (1970 data). The positive income and employment impacts are discussed in Chapter IV. Discussion is also included on the positive and negative impacts of growth.

## 12. Allied Chemical

1. Comment: More data should be compiled on the phenols and radio-active emissions. It would appear that with the shale oil pilot-plant units in operation along with laboratory studies, actual calculations could be made on actual discharges with limits of error given rather than postulated calculations.

Response: The text has been revised in Chapter IV in the Effects of Air Pollutants on Man portion of the Socio-Economic Conditions section.

2. Comment: Emissions from the facilities, homes, automobiles, etc. in Grand Valley and Battlement Mesa areas should be determined and included in the environmental impact statement.

Response: Emission data projections were shown in the DES and are in the FES in Chapter IV, Table IV-10, for five alternate urbanization growths patterns at existing population centers in the Colorado River valley.

## 13. Corps of Engineers

1. Comment: The pumping stations for water from Parachute Creek and Colorado River should be cited to avoid damage from floodflows.

Response: Design has not been completed at this time, this action will require a permit and clearance from the Colorado Department of Health, Water Quality Division, and the Corps of Engineers.

2. Comment: Backfill over pipelines at stream and drainage channel crossings should be protected with riprap to prevent future erosion.

Response: Grading to ensure natural drainage patterns is planned as a mitigating measure. If riprap is placed over pipeline at stream crossings it may cause added erosion because of the scouring caused by an uneven surface in the stream bed. The riprap would cause turbulence as water flows over it.

3. Comment: As indicated in the EIS, Department of the Army permits will be required where construction involves placing fill material or dredged materials in waterways of the United States. Under the expanded jurisdiction of Section 404 of Public Law 92-500, the requirement for Department of the Army permits for the following activities, and the impact of these activities, should be discussed in the EIS.

(1) Placing of fill in any streams with a normal flow of at least 5 cubic feet per second or their adjacent wetlands during construction of the pipeline, particularly the crossing of marshland between the Colorado River and Moab.

(2) Placing of fill in Parachute Creek or its adjacent wetlands during the development of the service corridor in Parachute Creek valley.

(3) Construction of the Davis Gulch Dam and Middle Fork Dam.

Response: The text has been revised in the section on Federal Actions in Chapter II to reflect the requirements of the Department of the Army permits under Section 404 of Public Law 92-500.

#### 14. Colony Development Operation

The majority of the comments in this letter were of editorial nature dealing with changes in the description of the proposal and were incorporated into the FES where appropriate.

1. Comment: Page II-3, Figure II-2: As indicated in Mr. Foy's statement, La Sal Pipe Line Company has filed an amendment to the original right-of-way application which changes the alignment in the immediate vicinity of the Dow West property. All figures which show the right-of-way location should be revised, as appropriate, to reflect this change.

Response: See response to L. Foy - La Sal Pipeline Co. - Moab, Comment #2.

2. Comment: Page II-16, fifth line from bottom: The total emission rate of 20.4 Kgm/hr for particulates includes emissions from the mine vents and the primary crusher. Particulate emissions for the vents alone are estimated to be 11.4 Kgm/hr. (except during blasting activity).

Response: The text has been revised in Chapter II to include a number change in the Mining section and a sentence in the Crushing and Conveying section giving the amount of dust generated at the primary crusher.

3. Comment: Page II-35, first sentence: The first sentence should be replaced with the following sentences: Arsenic is removed at the rate of 531 lbs/day from the feed to the reactors utilizing a proprietary catalyst. Solid wastes containing approximately 20% by weight or 106 lb. of arsenic of which 29 ppm (28 lbs./yr) is soluble, the arsenic in chemical form only slightly soluble in water will be transported to the spent shale disposal area and mixed with the processed shale as discussed in greater detail on page II-53.

Response: The text has been changed in Chapter II in the Gas Oil Hydrogenation Unit portion of the section on Retorting and Upgrading by use of the above information which has been slightly modified.

4. Comment: Page II-48, Table II-13: Table II-13 should be revised as indicated in Attachment 5 to be consistent with the revised EIA.

Response: The Table has been revised. The annual production column has been calculated from the assumption that production will occur 365 days per year. The changes by Colony in Attachment 5 reflect production for only 90 percent of the year. The original figures for wastes generated during a full production year will remain in the Table; they represent the highest amount that could be expected in a full production year.

5. Comment: Page II-54, Table II-16: Table II-16 should be revised as indicated in Attachment 6. Table should reflect the reduction by 95% (or more) of  $\text{SO}_2$  in the preheat system and the reduction of fuel gas sulfur content to 10 grains per 100 standard cubic feet (by amine scrubbing) in the gas recovery and treating unit. Revised annual emissions from the shale oil plant (mgm/yr) shown in Tables II-16, II-17, II-18, II-19, and II-20 reflect the fact that not all units in the plant will operate at full capacity year round. Anticipated operation of pyrolysis and upgrading units include shutdowns or operation at reduced throughput as required for preventative maintenance or repair of random equipment failures.

Response: The figures in the Mgm/yr column will remain the same, except to reflect changes in previous tables for emission rates. Normal emission rates in the tables showing emissions for the various units in the Retorting and Upgrading section of Chapter II represent estimated means for all anticipated operating modes. The peak emission rates given in the same tables are maximum rates which may be encountered when all processing units are operating at full capacity. These assumptions were used in compiling the annual emission rates, which were merely increased by a factor of  $24 \times 365$ , in the tables showing expected pollutant emissions from the shale oil plant.

6. Comment: Page II-62, fourth paragraph: page VI-5, fourth paragraph, Present paragraph is based on the assumption that Colony intends to cover processed shale embankment with 6-inch layer of natural soil. Depending upon the success of direct revegetation on fertilized processed shale, soil cover may be unnecessary.

Response: The text has been revised, Chapter II, Solid Waste Disposal.

7. Comment: Page II-67: Discussion under "Water Supply" should be revised to include full discussion of contract for water from Ruedi Reservoir .

Response: See D. McSparran - A.R.Co. - Grand Junction, Comment #2.

8. Comment: Page II-69, third full paragraph: Colony does not plan to capture and recycle all water draining from the Dow West property as stated on page II-69. Runoff in Middle Fork in excess of the dead storage capacity of Middle Fork Dam will be passed through the reservoir . In addition, Colony plans to release water below the Davis Gulch catchment dam to insure the protection of senior downstream water rights .

Response: The text has been revised in Chapter II, Water Supply .

9. Comment: Page II-92: Although induced population is discussed in terms of five hypothetical patterns in this section, the same topic is analyzed in terms of the three cases described on page IV-188 in Chapter IV. A more thorough explanation for the use of the distinct methods of analysis should be included .

Response: The three cases discussed were for illustrative purposes only . A county-by-county breakdown focuses primarily on Mesa and Garfield counties . The FES discusses the new town to the extent that plans regarding it have evolved . Patterns IV and V are different types of new town alternatives .

## CONSULTATION & COORDINATION

10. Comment: Page III-11, Table III-1: Except for particulates, the concentrations listed in Table III-1 are universal theoretical estimates extracted from the Dames & Moore study. They are not based on measurements taken at the semi-works plant site. If the intention is to make use of the theoretical estimates, the following clarifying changes should be made. The first sentence of the last paragraph of page III-11 should be deleted. The word "were" in the third line of the last paragraph should be changed to read "have been". The words "in Parachute Creek" should be deleted from the fourth line of the last paragraph. In view of the fact that the particulate concentration is not a theoretical estimate, and that Dames & Moore concluded that background levels of particulates have median values less than  $15 \text{ ug/m}^3$ , "Particulates" should be deleted from Table III-1.

Response: The universal theoretical estimates of ambient concentrations of pollutants derived by Dames and Moore in Table III-1 have been abandoned and more applicable data have been used from the first year of environmental baseline studies on Oil Shale Tract C-b. It is felt that these statistics better represent ambient air conditions at the proposed Roan Plateau plant site than did "theoretical estimates" for the semi-works plant site in the Middle Fork canyon bottom. The text has been revised in the Climate and Air Quality portion of the Mine and Plant Site section of Chapter III. Later chapters have been revised to incorporate these values.

11. Comment: Page III-33, first two paragraphs: This section should be broadened to include a discussion of Colony's private water rights. See "Preliminary Water Supply Strategy for One Oil Shale Plant in Parachute Creek Basin," Wright Engineers, April, 1973 - Colony EIA Appendix, Volume 12. It should be emphasized that Colony's private rights are of relatively high priority and that except during periods of extremely low flow in the Colorado River, Colony's rights will be adequate to satisfy the full requirements of the plant complex.

Response: These two paragraphs are a discussion of some basic facts of Colorado Water Rights not of Colony's rights.

12. Comment: Page III-52, last line: Add the following language after "historical significance." ...although, as indicated on page IV-172, the proposed plant and pipeline should not disturb any recognizable or unchanged portion of the abandoned grade.

Response: It is not proper to discuss impacts in the Description of the Environment Chapter. The discussion of impacts or lack of impacts is continued in Chapter IV.

13. Comment: Page III-87: No discussion of employment multipliers is found in the section entitled "Employment." In view of the impact of indirect or secondary employment resulting from the project, a discussion of the current multiplier effect from different segments of the economy is suggested.

Response: Current employment relationships are shown in Table III-22. Employment multipliers information is unknown. BLM has contacted with CSU to develop region-specific economic and employment models that will describe both the existing situation and impacts, given specific exogenous influences (such as the Colony proposal): The report will be available to the public when the study is complete.

14. Comment: Pages III-90, III-91: A comparison of data on remaining bonding capacity in this section with data in the report entitled "Impact - and Management Region 11," December, 1974, indicates that the unused bonding capacity for some school districts may be less than is listed in the impact statement. For example, Table III-25 states that the Grand Valley School District has a remaining bonding capacity of \$408,160 while the study referred to above indicates only \$237,779 is available.

Response: Table III-25 has been revised to reflect changes in state legislation (revision of school district bonding limits) and newer data. All information in that table is subject to change as population levels, private development, assessed valuation etc. change. Changes in that data occur annually at a minimum.

15. Comment: Page III-153, second paragraph: Colony has attempted to locate and count these horses for several years without success. A reference to the basis for the conclusion stated in the second sentence of this paragraph would be appreciated.

Response: The information concerning this herd of free-roaming horses was obtained from the BLM office in Craig, Colorado. The basic document containing this information is now referenced. The Craig office is in the process of preparing a management plan specifically designed for this horse herd in the Piceance Creek Basin.

16. Comment: Page III-160, third paragraph: This paragraph should be clarified to state that the pipeline right-of-way will be routed around existing or potential slide areas.

Response: The text has been revised in the section in Chapter III on the description of the Pipeline Route over the Roan Plateau as a result of more detailed study and field examination of the slope stability problem. The pipeline route will actually cross only about one mile of colluvial deposits at the base of the east side of Long Point. These deposits consist of slopewash and/or very slowly creeping to stable talus, and presently do not appear to pose the problem of slides. Therefore, the existing pipeline route appears to be free of serious problems involving active landslide areas.

17. Comment: Page IV-2, Table IV-1: The attempt to quantify qualitative judgments in this form can be extremely misleading. Readers should be cautioned that the judgments presented are summary in character and that the actual text should be examined to determine the BLM's actual conclusions as to the degree of specific impacts.

Response: The text has been revised in Chapter IV, Introduction.

18. Comment: Page IV-7, fifth paragraph: The Battelle Northwest study did not include emissions from the utility boilers at Grand Valley, portal transfer point, transfer tower and reclaim tunnel due to the fact that they are in locations remote from the plant site or at substantially different elevations. A statement to this effect should be added to this paragraph.

Response: The text has been revised to include the above clarifications in Chapter IV, Climate and Air Quality.

19. Comment: Page IV-9, Table IV-2: Table IV-2 should be revised as indicated on Attachment 12.

Response: The Table has been revised to coincide with Table II-21.

20. Comment: Page IV-10, fourth full paragraph, second sentence: The meaning of this sentence is unclear.

Response: The text has been revised in the Climate and Air Quality section of Chapter IV to indicate the approximate percentage of the highest estimated annual concentration level of the individual pollutants which would occur in Parachute Creek valley.

21. Comment: Page IV-10: The evaluation of computer predictions of 3 and 24 hour maximum short term concentrations fails to account for the fact that meteorological data were not available for a full 365 day year. While it is true that data were obtained for 12 calendar months, and resulting projections should be reasonably reliable, occasional meteorological data losses inevitably occurred. In predicting the number of days or hours per year that a given concentration might be exceeded, it is therefore necessary to "normalize" the computer projections. This subject should be further examined with personnel familiar with the Battelle Northwest study.

Response: The text has been revised in Chapter IV, Climate and Air Quality, to indicate that the Battelle data (Table IV-3) has been normalized, and why it was necessary.

22. Comment: Page IV-27, second paragraph, second line: Substitute the words "air contaminants" for the word "emissions." This paragraph should also be revised to indicate the need to normalize projections.

Response: The text has been revised in the Climate and Air Quality section of Chapter IV by the substitution of the words "air contaminants" for "emissions", and the need to normalize the computer projections for yearly occurrences is explained. The frequency of occurrence summaries for concentration levels of 3 and 24-hour periods in Table IV-3 have been revised (normalized).

23. Comment: Page IV-27, last sentence; Page IV-31, third paragraph, lines 2 through 4; and Page IV-51, first full paragraph: Conclusions fail to account for the fact that Colony should be able to avoid actual violations by curtailing operations or by burning hydrotreated shale oil as a plant fuel whenever local ambient concentrations of SO<sub>2</sub> produced by the plant approach applicable state limitations. The sulfur tail gas unit emission rate used in the Battelle Northwest study was based on an assumed concentration of 250 ppmv; emission concentrations resulting from actual operations could be substantially lower. Page IV-51, first full paragraph: Conclusion regarding state standards may be inaccurate if the revised state standards apply on the property.

Response: No text changes are necessary here because Colony's commitment to fuel switching if SO<sub>2</sub> concentrations approach the State of Colorado's standards is stated in the revised Colony's Commitments portion in the Air section of Chapter V. The sulfur tail gas unit emission rate used in the Battelle study was qualified, as stated above, in the portion on sulfur dioxide for the Climate and Air Quality section of Chapter IV. The revised State of Colorado air standards do apply on the Dow West property.

24. Comment: Page IV-28, seventh line: Substitute "theoretical ambient background" for the words "existing ambient."

Response: Ambient air quality data from the first year of environmental baseline studies for Oil Shale Lease Tract C-b have been used as estimates of ambient air quality data for the mine and plant site. The values are measured. Therefore, they are not theoretical.

25. Comment: Page IV-28, eighth line: The following sentences should be inserted after the sentence ending "Creek area". Measured background levels are low enough to tax the ability of available instrumentation. Data obtained to date indicate no serious discrepancies when estimating average baseline concentrations, although some relatively high short term levels of particulates have been observed.

Response: Ambient air quality data from the first year of environmental baseline studies on Oil Shale Tract C-b was applied to Colony's proposed mine and plant site area. This data is evaluated in Chapter III in the Climate and Air Quality portion for the Mine and Plant Site section. The sentences suggested to be added apply to the universal theoretical estimates for concentrations of ambient air pollutants at the semi-works plant and not to the data used from Oil Shale Tract C-b. Therefore, the above sentences do not apply and should not be added.

26. Comment: Pages IV-28, eleventh line from bottom; IV-31, ninth line; IV-33 sixth line and seventh lines from bottom; IV-34, eighth line; IV-211, sixth line from bottom; IV-214, fifth line: The high ambient concentrations of pollutants predicted at grid point 135 should be used with extreme caution due to the lack of consistency with the surrounding grid points. The high anomalous predictions at this point could be due to incorrect data input or computer error. No logical reason can be found to explain why such high values could occur at such a distance from the plant site.

Response: the relative confidence level of a single calculation is mentioned in Chapter IV, Climate and Air Quality. The text has been revised to include specific reference to anomalous grid point 135.

27. Comment: Page IV-28, fourth paragraph: Discussion fails to distinguish between total hydrocarbons and non-methane hydrocarbons.

Response: The Battelle study gives data for annual mean concentrations of total hydrocarbons. Data for non-methane hydrocarbons are not included. It is therefore necessary to use the available data for total hydrocarbons when a comparison is made to Federal air quality standards for non-methane hydrocarbons. Because the methane contribution to total hydrocarbons is not considered in the Battelle study, comparisons to Federal air quality standards for non-methane hydrocarbons will tend to be biased toward more frequent violations of this standard.

28. Comment: Page IV-31, line 5: An annual mean of  $3.5 \mu\text{gm}/\text{m}^3$  would violate the revised state standards for Category I areas. Colony anticipates, however, that the Piceance Basin will be reclassified as a Category 2 area in anticipation of oil shale development. In addition, computer models are not precise and are generally conservative on the side of over-predicting ambient concentrations. Furthermore, projected ambient  $\text{SO}_2$  concentrations should be judged in the light of the observations set forth in Comment 115 above. It is also unclear whether the revised state standards are intended to apply within the property boundary.

Response: The current State  $\text{SO}_2$  standard would be exceeded by about 17 percent in the present Category I area. The text in the Climate and Air Quality section of Chapter IV has been revised to show this. Although it is true that the Piceance Creek Basin may be classified as a Category II area, that result cannot be anticipated in this analysis. The shortcomings and uncertainties of diffusion modeling by computer are mentioned earlier in Chapter IV.

The revised State of Colorado's standards for ambient air apply to all formerly non-designated areas; this includes public as well as privately owned lands.

29. Comment: Page IV-33, third full paragraph: The following new last sentence should be added to this paragraph: Particulate emissions from the primary crusher were not included in the Battelle Northwest study.

Response: The text has been revised in Chapter IV, Climate and Air Quality, with the addition of the above clarification sentence.

30. Comment: Page IV-33, next to last line: The parenthetical phrase "(out of the 213 days for which calculations were possible)" should be inserted after the words "1 to 33 days".

Response: Battelle's original computer printout data for frequency of occurrence of 24-hour mean concentration levels were computed for only 213 days from which measurements were taken. The values in Table IV-3 have been normalized to take into account that measurements were not taken for every day of the year, although the measurements were distributed fairly evenly throughout the year. Values in Table IV-3 represent projections of frequencies of occurrence if measurements had been taken over a full year.

31. Comment: Page IV-37, last line: Add the following sentences to the last paragraph: Such studies are generally used only for preliminary evaluations. Since no ambient air quality problems were indicated by these analyses, Colony did not consider it necessary to attempt more sophisticated modeling.

Response: The text has been revised in Chapter IV, Climate and Air Quality, to indicate the above points.

32. Comment: Page IV-41, last two lines: Comparisons of the values presented in Table III-1 and Table IV-9 are not valid. The values in Table III-1 represent theoretical long term average concentrations while the calculations in Table IV-9 are short term maxima. It should be noted, for example, that short term variations in naturally occurring concentrations could be expected to exceed the values set forth in Table III-1.

Response: Table III-1 has been revised according to air quality data for the first year of environmental baseline studies on Oil Shale Lease Tract C-b. This data represents annual average estimates of air pollutant concentrations and is no Table III-30 in the Climate and Air Quality section for the Mine and Plant Site in Chapter III. It is true that short-term variations in naturally occurring concentrations of air pollutants commonly exceed the annual average estimates of air pollutants, however, they are the only data which are available for comparison. The text has been revised in the section in Chapter IV on the Climate and Air Quality of the Parachute Creek valley to clarify what is actually being compared, on a short-term versus annual average time frame.

33. Comment: Pages IV-41 and IV-42, Table IV-9: The assumption that the worst ambient concentrations predicted by different diffusion models can be added together is not valid. The Battelle computer model was used to predict concentrations at specific grid points around the plateau plant site. The grid points used for the values presented in Table IV-9 are not stated, but it is likely that they are located on the plateau northeast of the plant site. The box model was used to predict concentrations in Parachute Creek canyon. Traffic related concentrations in the canyon could be highest when there is a low level inversion (say 300') with low wind speed. Under these conditions it is likely that plant and mine related emissions would not become entrained in valley drainage flow. In other words, the meteorological conditions which would produce a worst case situation in the valley would not produce a worst case situation on the plateau and vice versa. For this reason, it is questionable whether Table IV-9 and the related discussion are meaningful enough to be included in the final statement.

Response: The low confidence level of the resulting data from the diffusion model studies and the possible invalidity of the methods used for combining the results of these studies in Table IV-9 are stated in revisions in Chapter IV. Meteorological conditions in the valley and plateau may also not be simultaneously conducive to produce a worst case situation, as is also stated in Chapter IV.

34. Comment: Page IV-43, eleventh line: The statement regarding combined values on Table IV-9 in excess of applicable state standards should be reconsidered.

Response: It is true that the values in Table IV-9 are short term maxima and that combining these figures yields a low confidence level and may not be valid. These considerations are presented in the revised portions of the Parachute Creek valley portion of the Climate and Air Quality section of Chapter IV. The State of Colorado and Federal air standards to which the combined values are compared also represent short-term maximum concentrations.

35. Comment: Page IV-55, first full paragraph: The purpose and potential use of the turnout valve below the Davis Gulch dam should be mentioned in this paragraph.

Response: Both the Davis Gulch and Middle Fork dams will be constructed with 48-inch outlet pipes and chute type emergency spillways that will handle probable maximum flood on the respective watersheds. In the event of unusual precipitation events the outlet pipes can be opened to accommodate additional waters. This will tend to negate the danger of dam failure.

This information is present in the statement, the outlet pipe is depicted in Figure II-33 and the spillway is discussed under, Dam Failure.

36. Comment: Page IV-56, eighth line from bottom; page IV-93, fourth and fifth lines; page VI-4, sentences beginning on eighth and third lines from bottom; page VI-4, first paragraph; page VII-3, second full paragraph; page IX-26, second full paragraph. Should be clarified with the observation that due to storage and diversion projects completed since 1933, it is highly unlikely that the record low will ever be equaled again.

Response: The paragraphs referred to are supported by the Metcalf and Eddy study: Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks, Vol. 1, specifically, 10-17 in this volume.

37. Comment: Some reference to the benefits of releases from the Green Mountain Reservoir during low flow periods should be added to this section.

Response: Due to the small percentage of total stream flow, the benefits accrued from such a release would be too slight to be calculated.

38. Comment: Page IV-60, third and fourth lines; Page VI-4, first paragraph; Page VI-4 next to last sentence; Page VII-3, second full paragraph; Page IX-26, second full paragraph: Reference is made throughout the statement to the fact that mining activity and dewatering will seriously affect local spring and stream flows. Colony does not believe that this result will necessarily occur. The major springs at the head of Davis Gulch and Middle Fork appear to be perched on the top of the Parachute Creek Member, indicating that the member functions as an effective aquitard at that location. Colony's mining activity will only remove a portion of the Mahogany zone and it is expected to continue to function as an aquitard. In addition, there are other aquitards above the Mahogany zone. To the extent that Colony's wells or dewatering activities do reduce surface flow, releases of water from the river water pipeline will be made to protect owners of senior water rights.

Response: See response to D. McSparran - A.R.Co. - Grand Junction, Comment #4.

39. Comment: Page IV-61, last two lines: The Metcalf and Eddy study entitled "Water Pollution Potential from Surface Disposal of Processed Shale from the TOSCO II Process", October, 1975, concludes (contrary to prior expectations) that maximum penetration of water could be up to 5.5 feet in a year with double the average annual snowfall.

Response: The text has been revised in Chapter IV, Water Quality

40. Comment: Page IV-65, top of page: This discussion should be revised as appropriate to reflect results of Metcalf and Eddy leaching study.

Response: The text in the section on Water Quality of Davis Gulch in Chapter IV, has been extensively revised to compare ionic constituents for natural flows in Davis Gulch and the Middle Fork of Parachute Creek with runoff from processed shale in (also revised) Figure IV-9. The values for natural flows were obtained from the Metcalf and Eddy study of the Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks and the runoff values (also from Metcalf and Eddy) are from their study on the Water Pollution Potential from Surface Disposal of Processed Oil Shale.

41. Comment: Page IV-65, sentence beginning on fifteenth line:  
Conclusions regarding sulfates should be verified with Metcalf and Eddy  
and revised if necessary.

Response: The text has been extensively revised, as well as Figure  
IV-9. Values for natural flows in Davis Gulch and the Middle Fork of Parachute  
Creek and for runoff from processed shale were obtained from studies  
by Metcalf and Eddy.

42. Comment: Page IV-65, paragraph entitled "Metallic Elements":  
Trace concentrations of metallic elements in oil shale are shown in Table  
IV-13, page IV-63 of the draft statement. Leaching studies conducted on  
processed shale have been carried out and the results published by Metcalf  
and Eddy. Their studies indicate that total dissolved solids concentrations  
in the runoff will be higher but chemically similar to that observed in  
Parachute Creek.

Response: These results of the Metcalf and Eddy studies on processed  
shale have been included in the revised Sediment Levels and Salinity portions  
of Davis Gulch Water Quality in the Water Resources section of Chapter IV.  
These studies did not evaluate runoff from unprocessed shale (coarse ore storage  
pile), however, its rate of leaching should be much less than that of processed  
shale which has undergone the retorting process.

43. Comment: Page IV-67, sentence beginning on seventh line:  
Leaching studies on processed shale and spent catalyst mixtures were not completed for two reasons: (1) As indicated on page IV-68 of the draft statement, the relative quantities of catalyst material to be disposed of in the shale embankment will be almost insignificant and difficult to measure quantitatively and (2) it may not be necessary to dispose of catalysts in this manner depending on the availability of catalyst reprocessing services when the plant begins operation.

Response: The section of Chapter IV on the Metallic Elements of Water Quality in Davis Gulch has been revised to qualify the results of the Metcalf and Eddy study on runoff and leachate from a simulated shale embankment. These tests did not include the effects that process water and spent catalysts would have on the shale embankment.

44. Comment: Page IV-68, first full sentence: Conclusion regarding phenols should be verified with Metcalf and Eddy.

Response: The text has been revised in the section on Water Quality in Davis Gulch in Chapter IV to concur with the recent study by Metcalf and Eddy on the Water Pollution Potential from Surface Disposal of Processed Shale.

45. Comment: Page IV-68, last paragraph: The Metcalf and Eddy study did not include analyses for arsenic. This paragraph should be revised accordingly.

Response: The Metcalf and Eddy study - Water Pollution Potential from Surface Disposal of Processed Oil Shale from the TOSCO II Process contains analyses of runoff from spent shale which were conducted by Metcalf and Eddy in June, 1974. These studies were incorporated into a revision of the portion on Miscellaneous Pollutants in the Water Quality of Davis Gulch section of Chapter IV.

46. Comment: Page IV-69, third sentence: This statement should be verified with Metcalf and Eddy.

Response: No estimate of the total annual quantity of spent catalysts and contaminants produced by the upgrading units to be disposed of in the processed shale embankment was found in any Metcalf and Eddy study. Therefore, the estimate of 295,000 tons remains, as obtained from solid waste estimates in Table II-13.

47. Comment: Page IV-69, last paragraph, second sentence: As indicated in Attachment 13, it is not possible at the present time to predict with certainty what the future of the plant complex will be after conclusion of the Dow West project. The procedures summarized in Attachment 13 illustrate that Colony has considered some of the alternatives in detail. The fact that no ultimate decision has been made regarding the disposition of the plant complex does not necessarily indicate poor planning as this sentence implies.

Response: The text has been revised in the section on the Water Quality of Davis Gulch in Chapter IV to indicate that Colony has considered some of the alternatives regarding the future of the Davis Gulch dam, however, no ultimate decision has been made concerning its fate after conclusion of the Dow West project.

48. Comment: Page IV-88, last paragraph: Discussion should be broadened to include reference to Ruedi Reservoir.

Response: See response D. McSparran - A.R.Co. - Grand Junction, Comment #2.

49. Comment: Page IV-89: Discussion regarding spill potential should be revised consistent with statement of L.C. Foy.

Response: The text has been revised in the portion on Water Quality of Pipeline Corridor Streams in the Water Resources section of Chapter IV, to qualify the statistics of the National Petroleum Council and their relation to the proposed pipeline.

50. Comment: Page IV-91, fourth paragraph; Page VI-2, first paragraph: The first sentence is misleading. The 0.12 mg/l increase is nothing more than a hypothetical estimate based on an extremely simplistic set of assumptions. Depending upon the circumstances of Colony's actual water use, the net effect of the plant on downstream salinity could be beneficial.

Response: The text has been revised. see Chapter IV, Colorado River and Summary, also see Chapter VI, Water Resources.

51. Comment: Page IV-91, sentence beginning on fifth line from bottom: Actual reduction of water flow in Parachute Creek should be less due to use of turnout valve to protect senior water right owners.

Response: The text has been revised in Chapter IV, Colorado River, Summary.

52. Comment: Page IV-93, first full paragraph: Less emphasis should be devoted to the impact of highly improbable events such as the failure of the Davis Gulch catchment dam and more emphasis should be placed on the impacts which are expected to occur as a result of normal plant operation. In addition, the discussion fails to consider the dilution which should take place within the dam in the event of such a flood. The last sentence overstates the potential effects on Parachute Creek and the Colorado River.

Response: The overtopping or failure of the Davis Gulch and Middle Fork dams was analyzed as a hypothetical worst case situation. The last sentence in the section on Summary of Water Quality in Chapter IV has been revised to restate the effects on water quality in Parachute Creek and the Colorado River.

53. Comment: Page IV-98, first paragraph: As indicated previously, Colony may not need to place a natural soil cover on the processed shale embankment as a part of revegetation program. This paragraph should be revised accordingly.

Response: The text has been revised in Chapter IV, Soils, Dow West Property.

54. Comment: Page IV-99, second paragraph, last sentence: This sentence states that 87.5 acres of selected lands will probably be covered with processed shale. In fact, 7.5 acres of land in Section 1, T 5 S, R 96 W are on the border of the plant site and may only be partially affected.

Response: The text has been revised, Chapter IV, Soils, Land Exchange.

55. Comment: Page IV-106, second full paragraph, first sentence: This conclusion is misleading. Non-commercial quantities of dawsonite, halite and nahcolite will be removed from the mine, subjected to the retorting process and dumped in the processed shale embankment. These minerals will not be "lost".

Response: The text has been revised in Chapter IV, Mineral Resources, to state that the minerals will be subject to retorting and dumped in the processed shale embankment.

56. Comment: Page IV-109, first paragraph: It should be noted that bauxite of commercial interest contains 40-50% alumina and that the 1% alumina found in raw shale beneath the Dow West property is far below the commercial grade of alumina ore presently of interest to aluminum producers.

Response: The text has been revised in Chapter IV, Mineral Resources, and this comparison is made.

57. Comment: Page IV-114, sentence beginning on fifth line from bottom: Conclusion stated is not correct and should be revised consistent with statement of L.C. Foy.

Response: The text has been revised in Chapter IV, Shale Oil Pipeline Corridor, to clarify where vegetation will be removed from the right-of-way.

58. Comment: Page IV-115, sixth line from bottom: It is doubtful whether deleterious hydrocarbons would remain in the soil very long. The aromatic factions should disappear rapidly from dry hot soil. In the absence of scientific reference material, the portion of this sentence referring to "long-term sterilization of the soil by persistent oil residues" amounts to unsupported opinion.

Response: The statement in question is somewhat qualified. There are in addition to those variables mentioned many others that will influence the duration of the deleterious effect. They include but are not limited to: soil type, temperature, duration of sunlight, viscosity of petroleum products, and viability and relative density of microorganism populations in the soil around the spill site. The term of sterilization may range from one to four or five years.

59. Comment: Reference to tobacco seems irrelevant considering the absence of tobacco in the vicinity of the plant.

Response: The reference to tobacco is merely an example of a sensitive plant which incurs damage upon exposure to moderate levels of SO<sub>2</sub> concentrations.

60. Comment: Page IV-129, last five lines: Meaning of last sentence is unclear.

Response: The text has been revised and clarified in the section of Chapter IV, Effects of Particulate Matter on Vegetation.

61. Comment: Page IV-133, second full paragraph, second sentence: This observation should be supported by specific reference to the threshold injury level involved, the type of vegetation likely to be harmed, and relevant scientific reference material.

Response: This is a summary. The details referred to in this comment are expanded on in the draft in the section of Chapter IV on the Air Pollutant Effects on Vegetation.

62. Comment: Page IV-137, sentence beginning on seventh line: Note Comment 38 above.

Response: Metcalf and Eddy in their study on groundwater for Colony, published in 1975 ("Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks"), believe that dewatering effects of mining will dry up or greatly reduce flow from springs in Davis Gulch and the Middle Fork of Parachute Creek. This would, in turn, decrease flows in the Middle Fork of Parachute Creek below Davis Gulch. Dewatering will occur mainly through the joint and fracture systems, which cut through the Parachute Creek Member and the Uinta Formation (aquitards not being excluded).

63. Comment: Page IV-139, fifth paragraph: What is the basis for these percentages?

Response: These percentages are based on the assumption that reduction of flushing action will relate on a one to one basis to stream flow reduction. This assumption was used for lack of better data.

64. Comment: Page IV-163, sentence beginning on tenth line: Trout are not stocked on the Dow property.

Response: The text has been revised, Chapter IV, Air Pollutant Effects on Wildlife, Summary.

65. Comment: Page IV-173: The data set forth in the center of the page relative to noise levels are somewhat irrelevant in that they relate to specific pieces of equipment designed for that facility. At the time that equipment was designed noise regulations did not exist. Noise regulations have been considered in the design of the commercial plant and operations will be conducted in accordance with applicable regulations.

Response: The text has been revised in Chapter IV, Sound Levels, by the addition of a paragraph which explains the conditions under which the sound level measurements were taken and what considerations will be taken concerning sound levels in the future.

66. Comment: Page IV-179, first paragraph: The statement is made that Phase I covers 2 years, while Table IV-24 shows a 40-month construction schedule. As a result, a three year Phase I seems more realistic.

Response: The text has been revised, Chapter IV, Socio-Economic Conditions.

67. Comment: Page IV-188: As indicated previously, further explanation should be provided for the switch from the five urbanization patterns mentioned in Chapter II to the three cases described on page IV-188.

Response: As indicated previously, the three patterns are used for illustrative purposes, and from a "county" point of view, are essentially inclusive of the five patterns discussed in Chapter II.

It should be noted that Patterns IV and V are different versions of a "new-town" alternative that has been revised in Chapter IX according to revision in plans and permits now held by Colony.

68. Comment: Page IV-209, last sentence: Without more specific information and in view of the observations set forth in Comment 115 above, the last sentence on this page amounts to no more than negative guesswork. Since it is not expected that primary national ambient air quality standards will be exceeded, especially in any urban areas, it appears unlikely that expected emissions from the proposed operations will result in any adverse health effects.

Response: The commitment by Colony to curtail operations or fuel-switch is stated in the Air section of Chapter V (Mitigating Measures). The statements in Chapter IV, Effects of Air Pollutants on Man, merely reflect the results of air pollutant studies by Battelle and others. The inadequacies and uncertainties of these studies have been qualified in Chapter IV. Some violation of the Federal secondary standard for particulates may be expected and the primary and secondary standards for nonmethane hydrocarbons may be violated. It appears unlikely that most types of expected pollutant emissions will result in any adverse health effects. However, for particulates and possibly nonmethane hydrocarbons, there are predicted violations of Federal air quality standards and the possibility of subsequent adverse health effects must be mentioned.

69. Comment: Page IV-223, first full sentence: There is no evidence that emissions from the plant complex will have any effect on human health.

Response: The sentence in the Summary of the Socio-Economic Conditions section of Chapter IV has been revised to state that it is unlikely that adverse impacts from air pollution on health will occur. Studies completed to date are not conclusive as to whether any adverse effects on human health will occur.

70. Comment: Page V-3, fourth full paragraph: As indicated previously, portions of Table IV-5 are out of date.

Response: The text has been revised in Chapter IV, Climate and Air Quality, to indicate the current State SO<sub>2</sub> and particulate standards. Table IV-5 has been also been revised.

71. Comment: Page V-5, fifth paragraph, first line: The words "up to 7,200 acre feet" should be substituted for the rate "12.5 cfs".

Response: The text has been revised in Chapter V, Water Resources.

72. Comment: Page V-7, twelfth line: If discharged water contains no pollutants, EPA permits may not be required. If permits will be required they should be added to the list of Federal actions described in the introductory chapters.

Response: The text has been revised to show that the permit is obtained through the Colorado Department of Health. See Chapter V, Water Resources. The introductory chapters were not changed, as they list only major overall actions.

73. Comment: Page V-9, last paragraph: Depending upon local climatological and soil conditions, it may be beyond Colony's power to "revegetate" within one year. It would be more reasonable to require Colony or La Sal to plant within one year.

Response: The text has been revised in Chapter V, Soils.

74. Comment: Page V-13, first two sentences: Colony's commitment to restore topography is only to simulate its original contours. Colony does not intend to restore its "original shape". In addition, there will be no need to reshape local topography in the event that the plant is sold or modified for use in processing Dow East reserves.

Response: The text has been revised, see Chapter V, Topography.

75. Comment: Page VI-1, third paragraph: The turnout valve on the river water pipeline should be mentioned. The reduction in average annual flow of Parachute Creek will not be as great as stated in this paragraph.

Response: The text has been revised, see Chapter VI, Water Resources.

76. Comment: Page VI-1, last paragraph: This paragraph should be reworded as follows: The projected water consumption of 12.5 cfs from the Colorado River would reduce the average annual flow of the river at DeBeque (3,659 cfs) by 0.34 percent. Any reduction in the flow of Parachute Creek as a result of dam construction on Davis Gulch and Middle Fork which could interfere with senior water rights will be made up by releasing water from the pipeline near the head of Parachute Creek valley. This release could be part of the 12.5 cfs of water diverted by Colony.

Response: The text has been revised, see Chapter VI, Water Resources.

77. Comment: Page VI-2, second paragraph: Include appropriate reference to Ruedi Reservoir.

Response: See response to D. McSparran - A.R.Co. - Grand Junction, Comment #2.

78. Comment: Page VI-2, third paragraph; Page VI-12, third full paragraph: At several points in the statement it is stated that the Middle Fork dam will reduce beneficial silt flushing in Parachute Creek. It should be noted that except for its dead storage capacity of 300 acre feet, the Middle Fork dam will automatically allow up to 400 cfs to pass through an outlet. Although the structure will serve to reduce the destructive effects of extremely high runoff events, it should not interfere with the beneficial flushing effects of seasonal runoff which is normally far below the 400 cfs flow through capacity.

Response: See response to D. McSparran - A.R.Co. - Grand Junction, Comment #7.

79. Comment: Page VI-3, fifth paragraph; Page VI-5, first paragraph: Depending upon the degree of dilution at the time of overtopping (and the incidental havoc a storm of proportions sufficient to cause overtopping would wreak on Parachute Creek) or dam failure, it is possible that the degree of adverse impact may not be as acute as suggested by this paragraph.

Response: This is a worst case situation due to the many unknown variables, several of which your comment mentions.

80. Comment: Page VI-3, last sentence: This sentence should be completely revised. The paragraph should contain general conclusions regarding runoff from spent shale based on the Metcalf and Eddy leaching and runoff study, and the CSU (or "Ward") study referred to in earlier portions of the text.

Response: The text has been revised in Chapter VI, in the section on Water Resources to indicate when runoff may occur below the Davis Gulch dam and what the general results of studies by Metcalf and Eddy determined about its quality.

81. Comment: Page VI-4, third paragraph: To put this impact in perspective, some mention should be made of the fact that sediment loads in Parachute Creek and in the Colorado River occasionally reach very high levels during runoff events such as thunderstorms (which occur regularly) and spring runoff.

Response: The water quality situation was discussed in Chapter III, Water Quality.

82. Comment: Page VI-7, second full paragraph, second line: As indicated previously, to say that the alumina is "lost" is misleading.

Response: The text has been revised in Chapter IV, Mineral Resources, to state that it is not currently economically feasible to recover alumina from oil shale.

83. Comment: Page VI-9, second full paragraph: Without reference to specific long-term ambient concentrations predicted by the Metcalf and Eddy study and the specific types of local species that will be affected in this manner, this paragraph constitutes nothing more than unsupported speculation.

Response: The text has been revised in Chapter IV, Vegetation, to clarify that concentration levels of combined  $\text{SO}_2$  and  $\text{NO}_x$  may rise above the threshold levels for plants at least once per year.

84. Comment: Page VI-10, third paragraph: To cite illegal hunting of golden eagles ( a Federal offense) as an impact of the project is stretching a bit.

Response: Although the increase in population, it is reasonable to expect a higher incidence of this type of activity. The sentence has been revised in Chapter VI, Fish and Wildlife.

85. Comment: Page VI-10, fifth paragraph: The draft statement contains no basis for the "slight effect" mentioned in this paragraph.

Response: As summarized in Chapter IV, Air Pollutant Effects on Wildlife there is a slight chance that wildlife could be affected. As was stated the lack of studies provide no basis for an assumption. However, it is felt that the possibility of impacts to wildlife does exist.

86. Comment: Page VI-13, last paragraph; page VII-5, last paragraph: Here and in other sections of the statement reference is made to the impact of the project on "secretive" local populations of bear and mountain lion. The statement fails to point out that confirmed sightings of these species in the areas which will be affected by the construction of the plant complex and service corridor have been extremely limited in recent years. To the extent that the local disappearance of these species is due to general population increases and related development, further reductions in local numbers are likely to occur regardless of whether the plant is built. Considered in this context, the additional impact attributable to the Colony plant may be less significant than indicated.

Response: The term "secretive" is meant to mean that the species avoid human contact. Therefore, it can be assumed that sightings would be limited. Other areas, in the general vicinity, have experienced a population increase of the bear and mountain lion even though the general area is experiencing a human population and development increase. With the increased accessibility and human presence it is felt that these species will leave the area in search of seclusion.

With the overall development of the area the secluded areas are becoming less. Therefore increased competition for food, habitat, and living space could cause a reduction in the population.

87. Comment: Page VI-18: The availability or lack of sufficient quantities of housing may pose substantially different problems during the construction phase as opposed to the operation phase. More discussion relative to housing of these two distinct phases is suggested.

Response: The text has been revised in Chapters IV and VI under Socio-Economic Conditions.

88. Page VI-18, second paragraph: The construction of mobile home parks is subject to strict local building codes and zoning regulations which should eliminate this potential problem.

Response: BLM is aware of the authority of local governments to enforce building codes and zoning regulations.

Mobile and modular homes are socially acceptable housing technologies, and their use is not known to impose the threat of a "potential problem". Yet mobile home parks are not viewed by all as being aesthetically desirable, even when they conform to local regulatory standards.

89. Comment: Page VI-19, first paragraph: Enforcement of applicable Federal regulations will ensure that inadequately treated sewage effluent will not be discharged into the Colorado River.

Response: This paragraph explores events that may occur. Realistically it should be noted that "variances" and violations of regulations are as much a part of life as the regulations. A discussion of the Denver sewer and water quality situation in the Platte River might be a good example. There is not intent to incite violations.

90. Comment: Page VI-19, last paragraph: In this paragraph and at page IV-206, the draft statement suggests that severely negative socio-economic impacts will inevitably result from the construction and operation of the plant. A more balanced analysis would include references to the fact that this area of the state is not without serious socio-economic problems at the present time and that the Colony project is just as likely to produce substantial socio-economic benefits for local communities. Although the negative bias may have been unintentional, the final statement should be more objective in its conclusions.

Response: It should be noted that the "acceptance" of new workers and their families and their resultant happiness or satisfaction will be as much a function of the attitude of existing area residents as it is a result of Colony's effort, etc.

91. Comment: It is ironic that Chapter VI, which is supposed to address unavoidable adverse effects of the proposed action, devotes so much emphasis to the impacts of avoidable events such as failure of dams, pipeline spills, etc. See also Page VII-5, last paragraph.

Response: The prevention of all dam failures, pipeline breakage or other spills cannot be completely avoided and, though unlikely, could possibly occur during the life of the project or in the case of dams during the period after the project has ended if they are not removed or perpetual maintenance is not performed.

Some wording changes have been made in Chapter VI to change the emphasis to that of the effect causing unavoidable damage rather than the event itself being unavoidable.

92. Comment: Page VII-3, first full sentence: This sentence should be revised to read as follows: A minute increase in downstream salinity may occur in time as a result of this project depending upon the actual circumstances of Colony's water use.

Response: The text has been revised in Chapter VII, Water Resources.

## CONSULTATION & COORDINATION

93. Comment: Page VII-3, first full paragraph: Paragraph should include a reference to future construction of Federal desalinization facilities.

Response: Discussion of such facilities are outside the scope of this statement, see Chapter I, Introduction.

94. Comment: Page VII-7, eleventh line from bottom: Depending upon the degree of planning by Colony and local jurisdictions, "over-crowding" may never occur.

Response: The text has been revised in Chapter VII, Recreation Resources.

95. Comment: Page VIII-1, seventh line: Change line to read "time, will be removed from underground reserves and deposited in the processed shale embankment".

Response: Tonnages of alumina halite and nahcolite do not qualify these materials as reserves because of their extremely low grade. The sentence has been revised, in Chapter VIII, Mineral Resources, to indicate that these minerals will not be wasted.

96. Comment: Page IX-4, first paragraph: The comparison referred to in the statement on the prototype leasing program is outdated. It is suggested that other source material be reviewed and that the final statement include an expanded discussion of this subject.

Response: The text has been revised in the section on Delay Development in Chapter IX to state that a more recent analysis of energy alternatives is given in the 1975 report entitled Energy Alternatives: A Comparative Analysis, by the Science and Public Policy program, University of Oklahoma.

97. Comment: Page IX-14, first full sentence: This statement is speculative and cannot be supported in fact.

Response: The text has been changed from "would" to "could," in Chapter IX, Off-Site Refinery.

98. Comment: Page IX-15, last sentence: It should be noted that substantial energy losses result from long distance transmission of electrical power.

Response: The text has been revised to include this concept. See Chapter IX, Total Power Generation.

99. Comment: Page IX-17, first paragraph: It should be noted that the cost of transporting raw shale long distances prior to retorting (either by truck, train, or slurry pipeline) would ensure the economic infeasibility of the project.

Response: The text has been revised, Chapter IX, Off-Site Refinery and Retort.

100. Comment: Page IX-18, first full sentence: The following sentence should be substituted for this sentence: These requirements cannot be satisfied with existing technology. Page IX-18 last sentence; Based on the status of the patent application, this statement amounts to mere speculation; Page IX-19, third and fourth paragraphs; Page IX-20, first thirteen lines: These conclusions cannot be supported in fact.

Response: The text has been revised, See Chapter IX, Waste Disposal, Underground Disposal.

101. Comment: Page IX-21, fourth paragraph: The last sentence is apparently based on the assumption that Colony's revegetation program will be unsuccessful.

Response: The runoff from a rock face would contain less T.D.S. and suspended solids than runoff from a well vegetated slope.

102. Comment: Page IX-24, RUEDI RESERVOIR: The treatment of Ruedi Reservoir as an alternative source of water rather than a proposed source is misleading. The section should be revised to refer to Colony's application for water from this source and its intended use of such water.

Response: See response to D. McSparran - A.R.Co. - Denver, Response #2.

103. Comment: Page IX-26, third full paragraph: Appropriate reference to the purpose of the turnout valve on the river water pipeline should be added.

Response: The impacts discussed are unmitigated impacts concerning the use of ground water. The discussion of a turnout valve would be mitigatory (See Chapter V, Water Resources) and not appropriate in this Chapter.

104. Comment: Page IX-67, PLANNED UNIT DEVELOPMENT: The PUD planned by Colony for Battlement Mesa constitutes an alternate solution to the local socio-economic impacts of the construction and operation of the plant. As such, the overall environmental impacts of this alternative should be discussed more thoroughly. The report entitled "Ecological Inventory of the Grand Valley Area", Geoecology Associates, 1974, Colony EIA Appendix Volume 16 should be quite useful for this purpose.

Response: Specific data regarding Colony's PUD proposal was not available at the time that the DES was prepared. More detailed information is included in the FES (Chapter IX, Planned Unit Development, and Appendix 5) and readers are directed to "Excerpts from: Battlement Mesa, Inc., Planned Unit Development Submittal, March, 1975", for further detail.

105. Comment: From time to time, the issue of the carcinogenic potential of materials used in and produced by the plant complex has been raised. Based upon its own analysis and extensive research work currently being conducted by outside consultants, Colony believes that the carcinogenic potential of these materials will be no greater than that normally associated with materials handled at any typical refinery. Although the BLM has been kept fully informed about this subject and the status of ongoing research work, this issue is not addressed in that this topic has not been adequately considered by the BLM, an appropriate discussion of the carcinogenicity of materials handled at the plant complex should be included in the final statement.

Response: The text has been revised in Chapter IV, Socio-Economic Conditions, Effects of Air Pollutants On Man.

15. U.S. Bureau of Mines

1. Comment: The voluminous statement is well prepared, exhaustive, and, in general, objective. It is readily apparent that at least some of the authors of Chapter VIII--irreversible commitments--tended to abandon the scientific and objective approach of other chapters and, ignoring the findings of earlier chapters, grossly exaggerated the losses from the project. This exaggeration is particularly apparent in the sections on aesthetic resources (such cliffs extend for a hundred miles along that section of the Colorado River valley), vegetative resources (25 acres out of the Roan Plateau), and human resources.

Response: Chapter VIII enumerates all of the resources that would be committed to different uses or changed. The resources listed in Chapter VIII may seem small, in acres or number, but it has been predicted that they would be eliminated or their utility would be lowered. An attempt was made to show the small magnitude of a change in a resource (i.e. 25 acres of conifer trees) to indicate significance of the change.

2. Comment: On page IX-2, lines 8 and 9 under "Colony's No-Action Decision", we believe there is not justification for the statement that ". . . the impact of no oil produced by Colony would not be significant". Only one oil field in Colorado -- Rangely -- has a daily producing rate higher than 47,000 barrels.

Response: BLM agrees that compared to other Colorado oil sources, the Colony operation would be significant. However, this statement and any decisions to implement the proposed action would have national significance and therefore the comparisons were made on a nation-wide basis.

18. Colorado River Board of California

1. Comment: It would also be helpful if the assumptions used in determining the potential increased salinity in the Colorado River were given (page IV-88).

Response: It was assumed that Colony's diversion would be an average of 10 cfs per day, every day, all year.

It was also assumed there would be a slight reduction in the diluting effect of upstream water resulting from Colony's diversion with no return flow. There is some reason to believe the reverse may be true, a decrease in salinity.

The concentrating effect of the diversion will, however, be so slight that it is beyond the range of accuracy of current sampling and averaging techniques.

2. Comment: In considering alternative water sources, the use of poor quality waters from the control of saline point sources such as Glenwood-Dotsero Springs for a portion of the water requirement should be given consideration.

Response: This is a logical alternative; however, to transport the water from the mentioned area to the Colony plant site would require a pipeline approximately 60 miles long. The environmental and economic considerations would be similar to those described in Chapter IX, Water Sources, for a pipeline from the White River to the plant site.

19. Roger Grette

Comment: In Chapter III, more research needs to be done in the archeological and paleontological section. Lawrence Royer has done a questionable study on the pipeline corridor and needs to be re-examined by an archeologist. Federal law prohibits the destruction of historical sites on public land; therefore, these sites need to be properly identified before pipeline construction begins.

Response: The cultural surveys discussed in the environmental statement do not constitute a cultural clearance as required by Section 106 of the Historic Reservation Act.

These surveys conducted by Colony consultants are not official because a Federal Antiquities permit is required for official surveys on national resource land. Federal permits are granted only by the Interior Departmental Consulting Archeologist in Washington, D.C.

Before authorizing a project (such as the pipeline right-of-way) on national resource land, an extensive cultural survey would have to be conducted by qualified personnel under an antiquities permit granted by the Department of Interior.

It is evident from the many comments in this regard, that surveys for archeology, history and paleontology are not adequate for the pipeline route.

20. U.S. Fish and Wildlife Service

1. Comment: III-123 Description of existing wildlife resources would be more complete if some mention were made of invertebrates and micro-organisms and of the inter-relationships among these organisms, soil, vegetation and larger forms of animal life.

Response: The text has been revised in Chapter III, Terminal Facilities and Service Corridor, Fish and Wildlife. Also a larger list has been added in in Appendix 4.

2. Comment: IV-58-Green Mountain Reservoir

It is stated that the reservoir would be drawn down annually about 8 feet below normal levels under worst conditions. We could not find any analysis of what impact this might have on the reservoir fishery.

Response: The text has been revised in Chapter IV, Surface Hydrology.

3. Comment: Releases from Green Mountain Reservoir during low flow periods could be expected to have some effect, possibly beneficial, on aquatic habitat of Blue River below the dam. We found no discussion of this potential impact on fish habitat. Water quality is mentioned on IV-88 but nothing on physical factors such as surface area, pool-riffle ratio, depth, etc.

Response: This impact was already addressed in the section on Colorado River valley in Chapter IV.

4. Comment: Increased stocking induced by increased fishing pressure would result in greater cost to the Colorado Division of Wildlife and a more artificial type of fishery.

Response: The economic impact cannot be estimated. It is assumed that an increase in a government program will cost more money. The DOW considers the majority of the study an artificial fishery at the present time.

5. Comment: "Alteration of strutting grounds could cause some loss in population numbers." In light of the specialized requirements for successful combination of strutting and nesting habitat, alternation of strutting grounds would almost certainly cause some reduction in population.

Response: "Could" has been changed to "would" in Chapter IV, Fish and Wildlife, Gamebirds.

6. Comment: IV-144-Aquatic Birds  
More emphasis probably should be given to the fact that 1,500 acre Moab marsh is almost the only sizeable block of wetland habitat within a large expanse of predominately arid terrain. The 15 acres to be lost is a small portion of the marsh. However, because of the limited amount of this specialized habitat in the general area, loss of even a small amount is potentially significant.

Response: It is felt that this area will recover rapidly. The long-term effect should be minimal. Colony will be required to re-seed the dryer areas which should accelerate the rehabilitation. Therefore, the loss of 1 percent of the marsh will only be for 3 to 5 years and the effects should be insignificant.

7. Comment: IV-146-Last sentence  
"There are no trout at or downstream of the river crossing." It should be added that the endangered Colorado squawfish does inhabit this portion of the river.

Response: The sentence is in error and has been deleted in Chapter IV, Fish and Wildlife, Fish. As shown on Figure III-20, there are numerous fish species plus rainbow trout.

8. Comment: IV-157-2nd Paragraph

We question the statement that "Eagles and most other raptorial birds are not usually affected by human activities in general." Repeated disturbance has been known to cause abandonment of nests. Also, even if a nest is not abandoned, exposure to predators and adverse weather is increased each time a parent bird is caused to leave the nest thus lowering the chances for successful reproduction.

Successful nesting by most raptors requires a suitable nest site near a productive hunting area. When an area containing this combination is rendered untenable through disturbance, a comparable replacement area is not always available.

Response: The text has been revised in Chapter IV, Induced Population.

9. Comment: IV-157-3rd Paragraph

An additional impact of disturbance would be increased physical stress on deer during critical winter periods when any added drain on an animal's energy can be crucial.

Response: The text has been revised in Chapter IV, Induced Population.

21. Federal Highway Administration

1. Comment: Our major interest is the adverse impacts the heavy industrial traffic and the increased traffic resulting from increased population will have on the highway system. These impacts are identified in the statement; however, the economic consequences are not adequately addressed.

Response: The assignment of costs is not possible at the present time. The increased maintenance costs to side roads is recognized. However, I-70 is being designed and built to withstand the traffic, therefore the proposed project should not add any unplanned maintenance expenses.

2. Comment: New construction and major reconstruction of the Parachute Creek service corridor and road service to a new town as well as extensive maintenance of the existing system are mentioned but the economic impacts of this work are not clear.

Response: Responsibilities for new construction of and/or reconstruction of the Parachute Creek service corridor has not been determined. Negotiation between Garfield County and Colony have also not yet determined the apportionment of responsibility and costs of constructing a new bridge across the Colorado River to the Battlement Mesa P.U.D. site. The Parachute Creek road has been designed and will be built to withstand the high volumes of traffic anticipated. Therefore, maintenance should not exceed pre-planned estimates.

3. Comment: The statement should address the cost of bringing the existing highway system to a standard which will accommodate the increased traffic and the responsibility for such cost apportioned to the proper jurisdiction, i.e., State, county, municipality, or developer. If this information is not available, the cost of restoring the highway system to a standard which will accommodate the future traffic after the initial major development phase, and when the industry is under a stable operation situation should be provided along with the aforementioned apportionment of such costs. The statement should also provide a better description of new roads and other highway related facilities necessary to accommodate the development and the responsibility for the costs.

Response: With respect to transportation of construction and plant employees between residences and the plant site a Colony Development Operation financial study prepared by Alan M. Voorhees and Associates, Inc. (See EIA Appendix #16) proposes a bus transit system including bus service to the mine portal and the process plant from a number of park and ride sites in the Grand Valley and Battlement Mesa areas. A second component would include a shuttle bus between employee homes and the construction marshalling yard near Grand Valley. It is expected that Colony would finance and manage this bus system with users reimbursing Colony for the services provided. Total plans are not detailed enough at the present to outline other road or transportation needs.

4. Comment: Of concern to highways also is the crossing by the pipeline of Interstate Route 70 near Cisco, Utah. At the permit stage and during construction we would expect adequate safeguards to assure no permanent disruption to the highway.

Response: Crossing of Interstate 70 by the pipeline would be done only after appropriate consultation and coordination has occurred among the project proponent, the BLM, the Utah State Highway Department and the Division Administrator for the Utah Federal Highway Administration. The crossing will require a permit from the State Highway Department and the concurrence of the Federal Highway Administrator. The State Highway Department would include in its permit such stipulations as are deemed appropriate.

25. Natural Resources Defense Council, Inc.

1. Comment: (page II-53 through II-66; see particularly II-53, II-62, II-66) Underground disposal is not being considered, and the specific method of shale disposal "has not been firmly established." Disposal of shale wastes is the cause of some of the most severe impacts of shale oil production. Certainly no project should be permitted to proceed until this issue is fully and completely resolved and the adverse effects minimized to the maximum possible extent. This is particularly important since it is proposed to use lands obtained from the Federal Government through land exchange for disposal of shale (see p. II-85, Table II-26).

Response: Underground disposal of spent shale is still being considered by Colony, and it is described in the Alternative Chapter (IX) of this analysis. Even if spent shale is disposed of underground, it would not eliminate the problem of surface disposal; processed shale would have to be stockpiled for 5-10 years prior to its redeposit back in to the mine, which could accomodate only about 80 percent of the volume of spent shale.

The specific method for disposing of spent catalyst and arsenic removal waste material in the processed shale embankment has not been firmly established. Colony describes its method of disposal of these wastes. Catalysts disposed of in the shale pile are considered insignificant from a composition standpoint, because their quantity compared to the quantity of processed shale is only 45 ppm.

2. Comment: (P. II-67, II-83, IV-56, IV-60 through IV-93) The fact that water supply and water discharge problems have not been fully resolved is another critical factor underscoring the inadequacy of the draft statement and the inappropriateness of completing the NEPA process at this time. Water resources are extremely scarce and adverse impacts on water supplies affect far more than the oil shale areas. Unless and until all water supply problems are resolved oil shale development projects should not be granted Federal licenses, permits, leases, etc. which enable the project to proceed.

Response: As discussed in Chapters II and IV, Colony has a definite water supply (Green Mountain Reservoir) and a zero discharge system. The only water leaving the Dow properties will be runoff. This is not considered a major problem.

3. Comment: (P. II-66) The revegetation problem is unresolved. Unless and until it is known that the wastes can be rehabilitated and revegetated, the project should not be permitted to proceed.

Response: Recent test by Colony and Colorado State University have shown that processed shale can be successfully revegetated.

4. Comment: (Chapter V, passim) Are Colony's "commitments" enforceable? If not, all such commitments should be made enforceable before Federal approvals are obtained.

Response: The purpose of Chapter V is to analyze all technically feasible mitigating measures. This includes those that are enforceable and those that can only be recommended to the proponent. Chapter V has been subdivided into required measures and those Colony has taken upon itself to implement, which are not enforceable.

5. Comment: (p. VIII-1 through VIII-7) If this Energy Output-Input Ratio is to be used for analytic, decisionmaking, or other purposes, it must be substantially improved. Significant costs are excluded from the analysis. Inadequate information is provided to permit relevant comparisons.

Response: The text has been revised in Chapter VIII, Energy Output-Input Ratio.

## 26. U.S. Geological Survey

1. Comment: In regard to surface-water resources, although plans for reclamation at the end of the 20-year plant life are indefinite (p. II-5, par. 4), "mothballing" treatment of the facilities should also include rehabilitation measures, especially in the waste disposal area. Such measures would be needed to minimize any effects of erosion resulting from excessive storm runoff.

Response: Because of the range of unpredictable factors which will influence the disposition of the complex, it is difficult for Colony to predict what will be done with the facility after its 20 year life. Colony, however, has made the commitment that they will revegetate the disposal areas regardless of what happens to the plant (i.e. it is "mothballed" or dismantled). The section Solid Waste Disposal in Chapter II has been revised to include Colony's commitment toward revegetation.

2. Comment: Further, inasmuch as a specific method for disposing of spent catalyst and arsenic-removal waste-material has not been firmly established (p. II-53, par. 3), monitoring measures should be considered for the disposal site in order to minimize any adverse effects on the hydrologic environment resulting from either stormwater runoff or percolation.

Response: In correspondence with this office Colony stated, "Colony does plan to monitor ground water, processed shale embankment variables, as well as other environmental factors during and following plant operation. Final plans are not established and would surely change if they were.

3. Comment: In order to minimize the effects of downstream flooding which may result from a surge flow from failure of both dams on Parachute Creek (p. IV-86, par. 3), measures permitting emergency releases of water from dams other than by overtopping should be considered.

Response: Overtopping cannot be considered an emergency release, rather it may be reason for a surge flow. See Figure II-33, Typical Earth & Rock Fill Dam, it has an outlet designed plus an emergency spill way is required.

4. Comment: There are many references to effects of dewatering during mining, in both the principal plan and alternatives, and to the possible effects of pumping ground water as an alternate source of supply (e.g., -IX-5, IX-6, IX-9, IX-26). Nowhere, however, do we find any concept as to the areal extent of the effects of dewatering. We believe that enough data are available, or can be obtained without unreasonable expenditure of time and money, to permit at least semi-quantitative estimation of this effect. Approximate life of the project, probable locations and depths of mining, order of magnitude of transmissivities and storage coefficients of aquifers involved, and existing ground-water level information (the factors which should provide a basis for such evaluation) should already be available from environmental assessment studies. It seems that for an operation of the scope of the proposed project a more adequate evaluation of the impact is warranted. Dewatering will also produce some subsidence

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in addition to that produced by other mining operations. Although in the immediate area of mining the magnitude of such subsidence from dewatering may be less in magnitude, it will probably extend over a much larger area. The statement does not appear to recognize subsidence from this source, as it should, both because of the impact on the environment and because of the possible impact on the project, for example, on engineering works.

Response: The Metcalf and Eddy study, contracted by Colony, entitled: Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks, Vol. 1, 1975 addresses the effects of dewatering during mining. The Sub-surface and Surface Hydrology sections of Chapter IV have been revised to incorporate the results of the Metcalf and Eddy study. It is Colony's responsibility to take subsidence into consideration when designing engineering works.

5. Comment: Duration and extent of post-project recovery in affected aquifers should be considered in terms of extremely long-term or permanent effects on quantity and quality of ground water.

Response: The influence of a mining operation on ground water would have to be considered very long-term or permanent since none of the geologic processes that form aquifers are now going on in the area.

6. Comment: Massive degradation of Parachute Creek and possibly the Colorado River are anticipated in the event of the failure of Davis Gulch catchment dam (p. V-3). Probable impacts on ground water should also be considered.

Response: It must be assumed this comment deals with VI-3 not V-3. Little if any damage to ground water will occur. To impact ground water would require considerable deepening of the stream bed. If this occurred the level of ground water would be lowered in Parachute Creek. This is not likely to happen, accounts of the Thompson Creek flood indicate the stream bed has widened but little if any deepening has taken place. Also the configuration of the valley would tend to lessen the scouring effect, as it progressively becomes wider with less gradient downstream.

7. Comment: The processed shale will contain about 0.11 ppm of soluble arsenic (p.IV-68); this will result in the continuous addition to the processed shale pile of about 12 pounds of soluble arsenic per day. Presumably this amount will be distributed fairly uniformly throughout the shale pile. In addition, however, soluble arsenic will be added to the shale pile after extraction from the feed streams. A proprietary process is to stabilize in relatively insoluble solid form 108 tons of arsenic extracted from feed streams per year. Disposal of the products of the proprietary process on the processed shale pile will add about 31 pounds per year of soluble arsenic to the pile, according to the text (p. IV-68). The manner in which this soluble arsenic is to be added to the pile is not explained. We note on page IV-68 that research on arsenic problems is in progress; however, we believe that the statement should be more explicit in treating mitigating measures. Specifically, the details of the program for disposal of the arsenic in the processed shale should include plans to prevent accumulation of the soluble arsenic at any point in the pile; that is, to achieve uniform distribution and prevent concentrated release from any accumulation that might by chance event become exposed. Furthermore, we believe the statement should consider other mitigating measures or other types of disposal of the arsenic in the event that the runoff water exceeds EPA criteria for potable water (0.05 mg/l), because streams of the area have periods of low or zero flow when concentrations in streamflow or in ground water receiving infiltration might cause degradation for considerable periods. As a result of the usual slow dispersion and dilution in ground water, detrimental effects to the human environment might be very long lasting.

Response: The presently preferred method for disposal of the catalyst waste material, containing soluble and insoluble arsenic, is stated in revisions in Chapter II, Solid Waste Disposal. An analysis of the possible impacts to water quality of arsenic in the shale pile is given in the revised section on the Water Quality of Davis Gulch in Chapter IV. BLM does not have the option of adding mitigating measures for Colony's proposal on the Dow West property.

28. National Park Service

1. Comment: Throughout the draft environmental impact statement the failure to indicate the recreational and aesthetic values to be found in Arches and Canyonlands National Parks and possible effects on them by the proposal are conspicuous by their absence. These values and their related socio-economic values and impacts to the States and counties involved should be a part of any analysis of impact on the region.

Response: A page was left out of the draft EIS in Chapter III, Recreation Resources. This has been corrected. Additional revisions have been made in the text in Chapters III and IV, Recreation Resources and Cultural Values.

2. Comment: No mention is made that preliminary wilderness proposals have been the subject of public hearings for Arches and Canyonlands National Parks (see enclosed copies of reports). Substantial portions of each area were proposed for wilderness designation and such designation would affect the use of these lands. Final proposals are in process of preparation for submission by the President to Congress. We suggest that the potential designation of these lands as wilderness and its effect on the proposal be reflected in the report.

Response: The text (Chapter III, Primitive Values, and Chapter IV, Recreation Resources) has been revised to include a discussion of these wilderness proposals.

3. Comment: A wilderness recommendation was submitted by the President to Congress for Colorado National Monument on February 8, 1976 (see attached report). No final action has been taken. The possibility of air contamination from the Colony Shale Development in the monument and its effect on wilderness quality should be addressed in the report.

Response: The text (Chapter III, Primitive Values and Chapter IV, Recreation Resources) has been revised to include a discussion of the wilderness proposal and possible effects on it.

4. Comment: In Page III-52 mention is made of the Escalante-Dominguez Trail. There is a bill in Congress to add this trail to the National Trails System. As the pipeline would cross this trail, the effect should be addressed in the report.

Response: The text (Chapter IV, Cultural Values) has been revised to include this.

5. Comment: Page IV-140: It is possible that an oil spill into the Colorado River may have some adverse impact on the bighorn sheep pasturing on parklands. We believe the extent of the impact would probably be minimal.

Response: It is felt that the chances of bighorn sheep drinking significant amounts of oil polluted water are extremely remote.

6. Comment: Arches National Park - Appendix 1. Figures 14 and 25 show an oil spill recovery site on Salt Wash at Wolfe (Turnbow) Cabin. The final statement should address the fact that this is a National Register property, establish what the impact of the project will be upon it, and how any adverse effects are to be mitigated.

Response: The text (Chapters III and IV, Cultural Values) has been revised to include this.

7. Comment: Figures 14 and 25 designate two primary recovery sites within Arches: Wolfe Cabin and where the main park road crosses Courthouse Wash. The primary recovery sites should be outside the park and proposed wilderness so that spill entry into the park can be prevented if at all possible. Perhaps the problem is partly one of terminology, but there should be emphasis and planning to prevent oil spill entry into the park if at all possible. Pages D-38 and E-16: As in our comments regarding Arches National Park, we urge that any oil spill be intercepted before reaching the park if at all possible, rather than leapfrogging back to Lathrop Canyon when interception is not feasible at the potash area.

Response: This stipulation has been added to the Cultural Values section in Chapter V.

8. Comment: Automatic gate valves should be considered on the pipeline at Courthouse Wash and at Sevenmile Canyon. This would effectively reduce the amount of spill and (a) prevent spill entry into the park, or (b) reduce the potential impact should spill entry occur.

Response: The BLM feels that automatic valves are not necessary at these points. Both drainages are intermittent and at least one and one-half miles from the park boundary. Due to the good access to these areas the oil could be stopped before it reached the park boundary.

9. Comment: While it is true that small earth-moving equipment can be brought in via the Lathrop Canyon jeep road (see page E-20) the equipment cannot be utilized in the recovery operation without inflicting severe, long-term physical damage to the environment. We do not feel that the relatively short-term (though severe) impact of an oil spill would justify drastic alteration of the physical environment. In addition, the topography is such that valuable time would be lost in constructing access from Lathrop Canyon to the actual recovery site almost two miles upstream (see Figure 17).

Response: As stated in the Oil Spill Contingency Plan (Appendix 1), Colony will confer with the appropriate officials to determine the actions to be taken after an oil spill. Provision are made to contain the oil and allow it to be biodegraded, if this will reduce the total environmental impacts.

10. Comment: It is our belief that if any oil spill recovery is made below the Potash area, that land access will be of only very limited value and that helicopters and boats are going to be the only feasible means of access.

This being the case, we feel that any oil spill passing the Potash area should be intercepted as soon as possible. Preferably interception should occur before the spill reaches the park. If this is unavoidable, it should be intercepted as soon as possible thereafter, whether above or below Lathrop Canyon on the river.

Response: This is detailed in the Oil Spill Contingency Plan. As previously stated Colony will confer with appropriate officials to determine method, access, etc. of oil spill recovery.

11. Comment: The draft environmental statement does not adequately address where the responsibility for maintaining the shale embankment and the settling pond dam residues; nor does it resolve the related problems that may arise upon conclusion of the project. The failure of the dam could have very serious consequences.

Response: The text has been revised in the section on Solid Waste Disposal in Chapter II to convey Colony's commitment that they will not "walk away" from the Davis Gulch dam and processed shale embankment if the commercial plant is ever permanently closed down. The commitment includes protecting the quality of Parachute Creek water and maintenance of the dam until revegetation of the processed shale embankment is self sustaining, capable of minimizing erosion and runoff is comparable to that from native soils.

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12. Comment: To the best of our knowledge, it has not been demonstrated that extensive vegetation can be grown on terrain comprising largely shale waste. Moreover, the presence of resulting unvegetated waste areas will require continued maintenance of the shale embankment.

Response: Recent tests by Colony and Colorado State University have shown revegetation is possible on processed shale without top soil. Refer to Chapter II, Solid Waste Disposal, for Colony's commitment on continued maintenance. Also refer to response to A. Stokes - Sierra Club - Denver, Comment #3.

13. Comment: It is not clear what will become of the saline drainage waters or the pipeline itself at the end of the project.

Response: The pipeline could be utilized by other oil shale developments, (Ca, Cb, and others) for transport of processed oil to market.

It is not clearly understood what is being referred to by "saline drainage waters".

14. Comment: If there is not enough salvageable topsoil taken at the site, what are the alternative sites to be used to recover the reclaimed terrain?

Response: Colony and Colorado State University are conducting experiments that, so far, show that processed shale can be revegetated without topsoil. Recent evaluations indicate that there may be enough topsoil to cover the pile with 3" of soil. Revegetation tests with 3" of topsoil have shown comparable results to those with 6" of topsoil. See response to A. Stokes - Sierra Club - Denver, Comment #3.

15. Comment: There is cause to wonder whether there may be a problem with subsurface water. If this is so, what happens to the life of an aquifer if it is drastically cut as in the case of substantial earth removal?

Response: If this happens there is little if anything that can be done to restore the flow of an aquifer.

16. Comment: Our review of the draft environmental statement with regard to the cultural resources that may be affected by the installation of the proposed pipeline suggests that many of our customary concerns have not been addressed as completely as would be desirable. This results in part from the fact that the proposed development plan is not completely clear on the matter of procedures that will be followed should unknown cultural resources be encountered within the pipeline right-of-way.

Response: The text in Chapter V, Cultural Values has been revised.

17. Comment: The statement also does not clearly confirm consultation with the State Historic Preservation Officers for the States involved. They are Mr. Stephen H. Hart, Chairman, State Historical Society, Colorado State Museum, 200 14th Avenue, Denver, Colorado 80203; and Dr. Melvin T. Smith, Director, Division of State History, 603 East South Temple, Salt Lake City, Utah 84102. The final environmental statement should reflect that they were consulted to determine whether the proposal will affect any cultural sites which may be in the process of nomination to the National Register of Historic Places and contain a copy of their responses.

18. Response: Comments have been received from both State Historical Societies. The FES contains copies of their comments and the responses to them.

Comment: The potential impacts upon archeological remains may indeed have been underestimated. The page IV-172 "Summary" for the preceding Cultural Values section does not establish how the positive impact will come about. That the pipeline construction may penetrate an archeological site and result in an increase in professional knowledge through the recovery of archeological artifacts is insufficient justification for following the proposed pipeline from Point (a) to Point (b). Recovery of such remains is considered to be a last resort after all other alternatives have been explored. Moreover, there are situations where it is regarded as better professional practice to leave such remains alone in an undisturbed state.

Response: The text in Chapter V, Cultural Values has been revised to state that an evaluation of the find will be made by qualified personnel. If the find is significant enough to warrant re-routing of the pipeline, this will be done rather than conducting a salvage operation.

19. Comment: The draft statement suggests that too great a reliance has been placed upon the inventories of cultural resources being made by the State Historic Preservation Officers for the States concerned. These are good as far as they go, but new sites are being continually added and it is generally recognized that they are far from complete. Likewise, we note that while the National Register of Historic Places was consulted, it was not the most recent listing.

Response: The text (Chapter III, Cultural Values) has been revised to include new information obtained from more recent inventories and surveys. Another cultural survey will have to be made for the entire pipeline route before a right-of-way could be granted. The February 19, 1974 listing of National Register sites as well as all monthly supplements have been reviewed up to the cut off date for printing the FES.

20. Comment: Consequently, there is a need for further professional survey. It is not clear in the draft environmental statement whether the professional surveys made to date included the Davis Gulch disposal site, the Davis Gulch and Middle Fork dams and reservoir areas, and the railway construction locations with their associated right-of-ways. If they have not been surveyed, this should be done prior to the preparation of the final environmental statement. The final statement should detail the results of the professional surveys and include the comments and recommendations of the investigations.

Response: See response to letter #8 (State Historical Society of Colorado) Comment #3.

21. Comment: There is as well a need to evaluate all known cultural resources as well as others identified in the course of the professional surveys. Page III-52 identified the Uintah Narrow Gauge Railroad grade. There are also references to other sites of potential cultural significance. In accordance with Executive Order 11593, Section 2(b) requirements, all of these sites should be evaluated for possible inclusion in the National Register of Historic Places.

Response: The text (Chapters III and V, Cultural Values) has been revised to expand on this and new information has been added.

29. U.S. Coast Guard

Comment: "The use of chemical agents (dispersants and collectors) should be reconsidered with the requirements of the National Contingency Plan (p. 2002.2, 2002.3 and 2003) ."

Response: This will be considered by Colony prior to the filing of the Oil Spill Plan with the appropriate Federal agencies.

30. U.S. Department of Health, Education, and Welfare

1. Comment: The production of 800 short tons of coke per day, unless adequately controlled, would pose a definite health risk to workers as a result of particulates emitted to the atmosphere by the production process.

Response: As discussed in Chapter II, the coke will be cut from the drums with water. This will reduce the particulates emitted to the atmosphere. When the coke is stored or placed in the processed shale pile it will be kept moist to prevent particulate emissions.

2. Comment: Nitrogen oxide emissions from diesel engines at 250 lbs/hr inside the mine would result in peak hourly airborne concentrations of up to 40,000  $\mu\text{g}/\text{m}^3$  or 20 ppm. This is extraordinarily high and would represent an unquestioned risk to human health.

Response: The 250 lbs/hr was selected as a "worst case" example. This concentration will be diluted by 7.7 million cfm of ventilated outside air which will result in concentrations of less than 5 ppm  $\text{NO}_x$ . Warm exhausts rise to the mine roof and tend to lower concentrations in the worker areas. Monitoring by MESA will insure worker safety.

3. Comment: During blasting peak hourly particulate loadings of 40,000  $\mu\text{g}/\text{m}^3$  in the mine would also be unacceptably high.

Response: As discussed in Chapter II, workers will not be in the mine during blasting. They will enter the mine after blasting and the ventilation system carries out the dust and smoke. Colorado Division of Mines requires that workers not enter the area of the mine influenced by blasting for a minimum of one half hour after blasting.

4. Comment: Fugitive emissions from crushing operations are not adequately controlled. These emissions could contain silica, carcinogens, and a number of trace metals. Unfortunately, relatively little is known about the health hazards of raw shale.

Response: The only sources of fugitive dust emissions will be at the truck dump and coarse ore stockpile. As discussed in Chapter II, the truck dump will be enclosed to minimize dust escape during windy conditions. The raw shale will be wetted to minimize dust. The stock piles will have moisture added as necessary. Colony must meet MESA standards for particulate matter i.e., Limit respirable quartz to 100 micrograms per cubic meter (respirable quartz is measured as particles less than 10 microns).

5. Comment: Pyrolysis of the raw oil shale into hydrocarbon vapors and liquids could lead to health conditions hazardous to human health.

Response: The text has been revised in Chapter IV in the Effects of Air Pollutants on Man part of the Socio-Economic Conditions section.

6. Comment: The simultaneous presence of amines as well as nitrogen oxides in the pyrolysis process could lead to the formation of nitrosamines, a potentially very potent class of carcinogens.

Response: Nitrates are not present during the pyrolysis process. The nitrates necessary for the formation of nitrosamines will not be present until they are added during the revegetation process.

7. Comment: No consideration is given in the document of the possible health implications of  $H_2S$  generated during pyrolysis. Also, the emissions of  $H_2S$  from the sulfur recovery unit could pose a health risk to workers.

Response: As discussed in Chapter II there will not be any planned emissions of  $H_2S$ . The  $H_2S$  will be flared to  $SO_2$ . In order to protect the workers in the event of an accident there will be constant monitoring, emergency breathing equipment available and intensive operator training.

8. Comment: The potential toxicity of the cobalt molybdate and nickel based catalysts for workers should be assessed.

Response: These catalysts have been used in refineries for decades. During this time protective measures have been developed and have proven very successful. Colony will follow the accepted practices which include protective clothing, respirators, and remote fresh air supplies. Colony must comply with the OSHA and MESA standards which are applicable at the time the plant is put in operation. Present standards are 1/10 milligram per cubic meter for cobalt dust and 1 milligram per cubic meter for nickel dust.

9. Comment: Arsenic removal of 531 lbs per day from the feed to the gas oil hydrogenation unit and at 59 lbs per day from the naphtha hydrogenation unit which are to be deposited in solid by dump trucks could pose an occupational hazard. There is a possibility that this arsenic could contain trivalent forms.

Response: Colony has stated that the arsenic will be handled with the utmost care. It is only very slightly water soluble and is not one of the more toxic forms.

10. Comment: The delayed coker unit which converts the heavy bottom oil from the pyrolysis and oil recovery units into lighter products and by-product coke by thermal cracking could be an especially troublesome occupational health problem unless properly controlled.

Response: COSH and OSHA regulations apply to some delayed coker operations; however, ARCO has developed its own, more stringent, safety procedures for delayed coker operations to insure that coker operators are not exposed to undue hazards. Colony will use the ARCO procedures, developed over the past 10 years of delayed coker operations in other refineries, for safe coker operation. The ARCO Safety procedures for delayed coker operation are available for public review at the ARCO and Colony Denver Offices.

11. Comment: Concentrations of contaminants in the workplace were not adequately considered. The primary concern for air quality was directed at the ambient air.

Response: As discussed in Chapters II and V, any source of air pollutants in the workplace will be monitored and safety measures enforced.

The mine and plant operation must meet the health and safety standards established by OSHA and MESA. OSHA standards are enforced by the Colorado Occupational Safety and Health Department under the provisions of an approved State Plan. MESA standards are enforced by the Colorado

Division of Mines under the provisions of an approved State Plan. Both OSHA and MESA make inspections to insure that the respective State agencies do a satisfactory job of monitoring and enforcement. Standards and monitoring techniques are being continually improved and Colony will be required to meet the standards and use the techniques that are applicable at the time it begins operation.

12. Comment: The construction phase of the shale oil pipeline was not evaluated with respect to possible occupational health hazards.

Response: The occupational health hazards associated with pipeline construction are eye burns from actinic light, inhaling welding fumes, inhaling dust from grinding operations, breathing fumes from and physical contact with flammable materials and plastics. There are OSHA standards and Colorado Occupational Safety and Health Administration (COSHA) standards limiting the pipeline workers' exposure to the above health hazards. These standards are enforced by COSHA in Colorado and the Occupational Safety and Health Division of the Industrial Commission of Utah in Utah. Compliance with the exposure limits reduces the risk of health hazard to the same level of risk experienced in average industrial occupations.

13. Comment: No assessment is provided of the possible safeguards for dangerous noise levels.

Response: Permissible noise exposure limits and locations of possible excessive noise impacts for the plant complex and support facilities are given in Chapter IV. Colony's commitments toward compliance with applicable noise standards and the possible methods to be used to achieve compliance are given in Chapter V.

14. Comment: The effects of discharging waste water into the Colorado River should be assessed with respect to salinity and the implications for potential impacts occurring as a result of using the water for crop irrigation or drinking by animals.

Response: Colony plans for a zero discharge from the plant and sewage disposal can not be conducted unless effluent meets standards set by the State Department of Health.

15. Comment: Finally, the statement does not discuss the possible alternative of utilizing nuclear energy as a source of power in lieu of a fossil fuel.

Response: The reader is directed to the USDI Final Environmental Impact Statement for the Prototype Oil Shale Leasing Program, 1973. This statement assesses alternative energy sources and their impacts.

### 31. Environmental Protection Agency

1. Comment: Under the Prevention of Significant Deterioration (PSD) Regulations adopted December 5, 1974, EPA has set standards for the country defining allowable increments of particulates and sulfur dioxide gas. The facility will be subject to these regulations as a Fuel Conversion Plant, which is category 18 of 40 CFR 52.21 (d). The present standards for this area and all regions of the country are the Class II standards

which define allowable increments of pollutants above existing background conditions. Therefore, the EIS must address the facility's ability to meet these PSD increments as follows:

Pollutant	Class II $\mu\text{gm}/\text{m}^3$
Particulate matter	
annual geometric mean	10
24-hour maximum	30
Sulfur Dioxide	
annual arithmetic mean	15
24-hour maximum	100
3-hour maximum	700

As a consequence of our review of the EIS, EPA believes there is the potential for violation of the 24-hour particulate Class II standard.

Response: These possibilities have been addressed in Chapter IV in the extensively revised Air Quality section.

2. Comment: Colony's particulate emission estimates do not include fugitive dust emissions. All point source emissions as well as fugitive dust, i.e. dust from construction areas, transportation induced dust, and dust from the spent shale pile, should be included in the emission estimates to determine ambient concentrations. Inclusion of fugitive dust emissions will make it more difficult for the facility to meet these air quality requirements.

Response: Colony's particulate emission estimates did not include fugitive dust emissions. It is questionable whether there are any reliable or meaningful methods for quantifying and modeling the effects of fugitive dust emission on ambient particulate levels. The Fugitive Dust section of Chapter IV has been expanded and revised to incorporate the above considerations. The Air section of Chapter V has been revised to indicate EPA's obligation toward control of particulates (includes fugitive dust).

3. Comment: Fugitive dust emission factors are included in Chapter IV, but this has not been carried through to determine estimates of particulate concentrations. While dust produced from construction activities may be excessive it will be temporary. Also, transportation induced dust will probably be highest during the construction period and then be somewhat reduced as activity is reduced and permanent roads are covered. Mitigating measures to reduce these sources should be determined by Colony and identified in the impact statement.

Response: The Fugitive Dust section in Chapter IV has been expanded and revised to incorporate several of the above considerations. Colony has indicated mitigation methods for dust suppression in Chapter II in the draft statement.

4. Comment: EPA is primarily concerned about dust emissions from the spent shale pile during placement of these tailings. This major source of fine windblown particulates has not been quantified nor even estimated. It is this source of dust that should be included with plant emissions to determine worst case conditions for plant operations. Colony's method of reducing these emissions should be analyzed in the final EIS.

Response: No estimate has been made of what amount of fugitive dust that may originate in the placement of the spent shale or the shale pile itself. The amount is expected to be very small, however, because of the moisturization of the shale prior to its placement, the vegetation on the surface of the pile, and the thin crust which would form on unvegetated portions of the pile. The section on Fugitive Dust in Chapter IV has been revised to mention the dust-generating possibilities of the spent shale.

5. Comment: The promulgated NSPS (New Source Performance Standards) also apply to storage vessels with capacities greater than 40,000 gallons that contain crude petroleum condensate, or finished or intermediate products of a petroleum refinery. To reduce emissions of hydrocarbons to the atmosphere, a vapor recovery system or equivalent control is required if the stored liquid has a true vapor pressure, under storage conditions, greater than 570 millimeters of mercury (mm Hg); and a floating roof or equivalent control is required if the stored liquid's pressure is between 78 and 570 mm Hg, inclusive. (See the Friday, March 8, 1974 Federal Register, pages 9300 to 9323). As a consequence of these regulations the on-site storage vessels and the 120,000 gallon Lisbon Valley storage tank will need a floating roof to reduce hydrocarbon emissions.

Response: As shown in Chapter II, Table II-22, of the draft statement, the 120,000 barrel storage tank will have a floating roof.

6. Comment: Additionally, information regarding air quality modeling efforts done by Colony are not fully described in the EIS. In order to evaluate the validity of this modeling, EPA requests a complete description of the Battelle Northwest modified gaussian plume model which was used for this effort. A description of assumptions used in the model would aid our review of the EIS. Pages IV-31 and IV-32 suggest that because of this uncertainty, the predicted concentrations are reduced, therefore concluding that no violations of the State air quality standards will occur. Using this reasoning the predicting concentrations could also be doubled based on this uncertainty as it implies a plus or minus confidence factor.

Response: The text (Chapter IV, Climate and Air Quality) has been revised.

7. Comment: Impacts on Surface Water Quality

A major deficiency of this proposal is the lack of plans by Colony which would provide for long-term maintenance of the spent shale pile. There are major unresolved questions regarding the ability and commitment of Colony to provide for this long-term maintenance after mining ceases. The company plans to replace top soil only on one-fourth of the 800 acre spent shale pile. Most studies to date indicate the unlikely success of revegetation on TOSCO shale with minimal soil cover. Company plans to dismantle the Davis Gulch dam if not sold would allow contaminated runoff from the disposal area to enter the Colorado River system.

Response: A statement on Colony's long-term commitment has been added to Chapter II, Solid Waste Disposal.

8. Comment: Page 4. The questions of whether or not the spent shale disposal area can be revegetated is a crucial one in terms of water quality, air quality, aesthetics, wildlife habitat, and the long-term productivity of the area to be disturbed. Although considerable progress has been made in identifying some of the constraints on establishing vegetation in a hostile environment, we are not aware of any technique that can promise establishment of a satisfactory plant community under the conditions described in the EIS. While the environmental statement acknowledges that the task of revegetation of the spent shale pile will be a difficult one, it does not describe the approach that will be taken in attempting to solve the problem, the level of commitment that the company has to successful revegetation on the site, or what Colony considers to be an acceptable level of rehabilitation.

Response: As described in Chapter II, the process Colony intends to use has been developed through years of research. They now have experimental plots that show a good probability of success on raw processed shale. Even on prime native topsoil a "promise" of success cannot be made. Again, Colony has made a long-term commitment in Chapter II, Solid Waste Disposal.

9. Comment: Although the plan for controlling erosion by structural methods on the spent shale pile is sound, (e.g. diversion structures, lateral drains, benches, etc.), the probability for erosion control by vegetative growth appears low. Research results with respect to vegetative stabilization on TOSCO II spent shale indicate limited success. Given the fineness of the materials, a south facing slope, and salt migration via the capillary action, successful revegetation does not appear promising. Also, given that Colony is "not committed to covering the entire pile with topsoil" (only 200 of the 800 acres), this essentially represents little commitment by the company to successfully revegetate 75% of the spent shale pile. Although Colony is committed to "continued seeding," given the lack of a plant receptive medium, sustained vegetative growth appears unlikely.

Response: Colony has test plots where vegetation has been established with only talus material covering the processed shale. This vegetation consists of forbs, grass, and shrubs. Tests with 3" of soil have been comparable to tests with 6" of soil.

10. Comment: Another serious water quality question is the fate of the dams, especially the Davis Gulch structure, after the plant ceases to operate. If the dams are simply abandoned or dismantled serious water quality impacts will almost surely result.

Response: See response to A. Stokes - Sierra Club - Denver, Comment #11.

11. Comment: The projected salinity increase of 0.12 mg/l at Hoover Dam as a consequence of project development should be reviewed. The associated economic loss due to this salinity increase of \$240,000 per mg/l increase to downstream users should be addressed in the final EIS. The 0.12 mg/l projected increase was based upon a withdrawal from the Colorado River of 10 cfs rather than 12.5 cfs as now proposed. Flow reductions in Parachute Creek due to construction of Davis Gulch and Middle Fork dams and flow reductions as a result of eliminating springs and seeps due to mining activities should be factored into the salinity calculation.

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An effort should be made to utilize more current salinity concentration information for Hoover Dam and the point of intake water diversion.

Response: The estimate of 0.12 mg/l is a theoretical calculation. It represents 1/60 of 1 percent of the present salinity of 730 mg/l, therefore it should be considered as insignificant.

12. Comment: It also appears that the TDS level in Parachute Creek and this in the Colorado River would increase due to uncontrolled runoff from the plant site, mine bench, possible power substation site, access roads, etc. Thus some attempt should be made to quantify the increase in TDS and factor it into the calculated salinity increase at Hoover Dam.

Response: Runoff from the plant site, mine bench and substation will not be uncontrolled.

13. Comment: The design of the Davis Gulch structure should be of sufficient capacity to impound all runoff. The EIS indicates that this structure will be designed for the maximum probable thunderstorm of one hour duration. This is no doubt the situation for the maximum case of rainfall, however, it may not be the situation for the maximum runoff condition. A fast, large snow melt caused by a long, slow spring rain with saturated soil conditions could easily be the maximum runoff case. What is the maximum runoff situation?

Response: Based on available data the probability of a runoff event such as this occurring is basically non-existent. This is based on the following:

1. Average annual precipitation in the basin is estimated to be 16 inches, range 15 inches to 17 inches.
2. Approximately one-half of that precipitation is snow. Of this approximately 3 inches of water equivalent evaporates per year.
3. Average temperature is 43.6°F with 5 months averaging below 32°F.
4. Average wind speed in Davis Gulch is estimated to be 3.8 mph with 4 mph or less during that period when rapid snow melt occurs.

Therefore, on an average year there could only be 5 inches of water in the snow. If we assume a doubling of snowfall to 32 inches there would be approximately 10 inches of water in the snow. Unless we experience a catastrophic climatic change it would be impossible to reduce this snow to water fast enough to overfill the Davis Gulch reservoir. The chute type emergency spillway would adequately handle the improbable possibility of overfilling. Should such climatic extremes occur the overflow water would be of approximately the same quality, if not better, as normal snow melt runoff.

14. Comment: The size and location of the surge and guard ponds are not specified. Will they be adequate to prevent any overflow that could result from the maximum probable rainfall?

Response: The surge and guard ponds will be designed to retain the maximum probable rainfall. The ponds will be located near the plant and upstream from Davis Gulch dam. The exact configuration and locations have not been determined.

15. Comment: Will any mulching, netting, fertilizers, or supplemental irrigation water, as used on Colony's present revegetation plots, be used in the disposal pile?

Response: The text has been revised in Chapter II, Solid Waste Disposal. Mulching, fertilizers, and irrigation will be applied as necessary. Netting may or may not be used depending on test results.

16. Comment: The EIS states that "Experiments are currently being conducted on the process shale containing representative quantities of mass catalyst material and test bins constructed to simulate the actual embankment, including representative depth and compaction densities. The reference for these experiments is written communication, however, if this is a reference to the Metcalf and Eddy study (Water Pollution Potential from Surface Disposal of Processed Oil Shale from the TOSCO II Process, October, 1975),

some discrepancies exist. The compaction densities used in the Metcalf and Eddy study are similar but no catalyst was placed in the spent shale (at least this addition was not mentioned) and the depth of the test bins were only 4.5 feet. Are studies using the spent shale and catalyst material contemplated? Are there any studies on spent shale rehabilitation using relatively deep piles?

Response: This sentence was in error and has been corrected.

It was determined in the Metcalf and Eddy study that 4.5 feet is the maximum depth that moisture would penetrate. Therefore, most studies use only 4.5 to 5 feet deep test bins. Presently Colorado State University is conducting studies using test bins 6 to 8 feet deep.

17. Comment: Further explanation of the reclamation plan regarding the sequence on shale placement is needed. For example, where will the disposal operation start, how will it proceed, what will be the configuration of the pile after 10 years? The method and sequence of the leaching effort to reduce salt levels should also be specified.

Response: The specific details requested have not been resolved by Colony.

18. Comment: The following subjects with respect to stability of the pile should also be addressed: the potential for slurry material to create a slump failure surface, flow type failure, and slumping potential for failing along contact between pile and original surface and long-term stability.

Response: The above considerations are discussed in the section of Chapter IV on Dam Failure, where Appendix A of the CH2M Hill study for Colony entitled "Hydraulic Analysis of a Hypothetical Instantaneous Surge Flow at Parachute Creek" treats the relative possibility of different types of failure. Colony is committed toward the long-term stability of the Davis Gulch dam and processed shale embankment. It will monitor the stability of the dam and pile and will maintain both after the commencement of mining until they are environmentally safe.

19. Comment: More information and discussion is needed with regard to the effect of mass movements on the process shale pile and also how the long-term effects of subsidence might affect the drains and catchment dams.

Response: It is felt that the discussion of modes of failure in the section on Dam Failure in Chapter IV adequately describes the possibility of mass movements. A study by Dames and Moore for Colony in 1971 entitled: "Slope Stability Studies, Proposed Processed Shale Embankment, Parachute Creek, Colorado" resulted in the present design for the shale embankment which would minimize the potential for saturation of the processed shale (a condition where the material loses strength and liquefaction slides may occur).

The design of the underground mine below the shale pile would minimize the possibility of subsidence. If subsidence should occur after the abandonment of the mine, Colony is committed to the long-term maintenance of the shale pile and Davis Gulch dam to insure against environmental degradation.

20. Comment: The proposed design of the river water intake structure should be defined. An EPA document concerning water intake structures recommends against channel intake structures since non-swimming fauna are easily taken into the pump. An alternative is the bank intake design whereby the stream velocity is maintained past such pumps, allowing most non-swimmers to be swept downstream by the current. (See "Development Document for Proposed Best Technology Available for Minimizing Adverse Environmental Impact of Cooling Water Intake Structures"/EPA 440/1-74-015).

Response: The text has been revised in Chapter II, Water Treatment, to indicate a bank intake structure. Colony will consider the above recommendation when the structure is designed. See text change in Chapter II, Federal and State Action.

21. Comment: Figure II-32 shows an increase from 70 gpm to 700 gpm after 12 years for revegetation with no apparent increase in water diversions. What is the source of this additional water supply?

Response: The 12.5 cfs usage of Colorado River water includes the 700 gpm for revegetation.

22. Comment: The channel alterations that will be made on 20% of the length of Parachute Creek between the confluence of Middle Fork and East Middle Fork Creeks and the Colorado River should be discussed in greater detail (see pp IV-55 - IV-56) and their impacts on water quality and aquatic life should be discussed.

Response: Garfield County will be responsible for the construction of the road from Grand Valley to the confluence of East Fork and Middle Fork. The design has not been established and the 20 percent alteration was only an estimate. The impacts from this estimated alteration are considered minor and short term, therefore, were not analyzed in detail.

23. Comment: Effects on Ground Water Quality  
The potential for contaminated waters to reach aquifers as a result of leachates moving through the spent shale pile is high. The EIS indicates water quality values for blended processed shale using distilled water. The conclusion is that actual concentrations will be lower than these values due to reduced particle - fluid contact and prior leaching of the shale. Reduction of compaction due to freeze-thaw cycle erosion; and the addition of very poor quality process waters, would indicate that the leachate could be very high in total dissolved solids. Therefore leaching of water contaminants is possible especially through the thinner areas of the spent shale pile at the edges and at the toe of the embankment. The leachate will be of extremely poor quality with a total dissolved solid (TDS) concentration as high as 40,000 mg/l.

Response: All of the above statements concerning leachates appear to be direct quotes from the Metcalf & Eddy study Water Pollution Potential from Surface Disposal of Processed Oil Shale from the TOSCO II Process, October, 1975. The DES preceded this study by ten months. Had it been available at the time of writing most of this information would have appeared in the impact section of the draft. The section on Water Resources in Chapter IV was extensively revised in the FES to include much of the results of the above Metcalf and Eddy study.

The above paragraph does not include Colony's proposed environmental controls which are in part stated in the same publication. Of primary significance to the problem addressed above the control; "All known points of emergence of groundwater flows will be capped and diverted to prevent irrigation of the disposal pile". Capping and diverting of these aquifers will prevent leachates from reaching them. Furthermore, Colony is planning to place the processed shale in side drainages to Davis Gulch, which at these higher elevations will be mostly above ground water aquifer interception problems.

24. Comment: It is stated on page IV-59 that development of a 4,100 acre mine will substantially impact aquifers located in the Uinta Formation and Parachute Creek Member of the Green River Formation. Mine dewatering is indicated but quality, quantity, and point of discharge are not addressed. The Metcalf and Eddy report noted that springs and seeps in Davis Gulch would be capped and diverted to prevent water entrance to the side or bottom of the pile. No mention is made of this activity in the EIS. Such structures are needed to prevent piping erosion of the pile and to reduce potential for groundwater contamination. Is this part of Colony's proposal?

Response: The portion on Subsurface Hydrology in the Water Resources section of Chapter IV has been extensively revised and expected flows into the mine from the various aquifers is discussed. The text has been revised in Chapter II, Solid Waste Disposal, to include capping springs and seeps. The diversion structures shown in Chapter II, Solid Waste Disposal, will be adequate to protect the shale embankment.

25. Comment: Additional information needed to evaluate effects on the groundwater system include the following:

1. More hydrologic information is needed in the Davis Gulch area, more than a generalized hydrologic cross-section of Piceance Creek Basin. The effects of mining on groundwater levels and quality in Davis Gulch and the Middle Fork Creek should be addressed. The hydrological relationship between the mining zone, and Davis Gulch, and Parachute Creek should be indicated.

Response: The effect of mining on groundwater levels whether under Davis Gulch, the Middle Fork of Parachute Creek, or the rest of the Dow West property will be to lower the water table and to drain those aquifers in the Parachute Creek Member above the mined area. The hydrologic relationship is that aquifer draining will reduce stream flow.

26. Comment: Does a natural barrier exist beneath the Davis Gulch and Middle Fork dams and under the spent shale pile that will prevent the movement of contaminated water into the groundwater? If a barrier does not exist, will any action be taken to prevent seepage?

Response: According to projections of regional fracture zones by Metcalf & Eddy there appears to be no direct contact between the two drainages. Recharge, movement, and storage tend to follow the fracture and joint systems. Also, the Unita Formation upon which the dams will sit is unimportant as an aquifer. The mining of the Mahogany zone in the pilot mine has been draining aquifers. Increased mining will further drain them, which will lessen the chance of movement of water from Davis Gulch to the Middle Fork of Parachute Creek.

27. Comment: EPA Recommendations to Protect Water Quality  
EPA recommends the following mitigating measures be adopted.

1. Preparation of Mine Abandonment Plan.

This plan would describe Colony's commitment to prevent serious water quality degradation to the Colorado River as a result of contaminated runoff escaping from the Davis Gulch disposal area.

2. Installation of Water Quality and Structural Monitoring Devices.

In addition to the surface monitoring stations on Parachute Creek, the EPA believes the following items of monitoring equipment are necessary to provide data on the effects of this operation.

a. A network of groundwater wells for sampling water quality and obtaining water level measurements should be developed both upgradient and down gradient of the mining area.

b. Regarding the spent shale pile, the following represents some monitoring methods which might be installed:

- moisture probes (e.g., tensiometers)
- salinity sensors
- temperature devices (thermography)
- structural monitoring
- embankment piezometers
- visual inspection
- log of spent shale characteristics
- inclinometers
- benchmarks
- seepage flow measurements
- settlement rods
- pressure cells

Response: Colony is required to file a mine abandonment plan with the State of Colorado. It is not feasible to ask Colony to make specific plans for abandonment at this time. Colony's general plans were outlined in the Draft Statement in Chapter V, Soils. Colony has not prepared their shale pile or groundwater monitoring programs but will consider any suggestions.

#### 28. Comment: Alternatives Analysis

Revaluation of alternative analysis for various aspects of this plant might include the following:

1. In regards to the need for 100 MW of power, the Public Service of Colorado study, Appendix 11, states that the Cameo Power Plant cannot supply the required power and meet existing demands. Thus, the present grid system may be energy short, and added electrical demand which would result from the proposed action would probably require additional generating capacity. That situation needs to be examined in some detail.

Response: A shortage of power would only occur if the power source was directly dependent on the Cameo Power Plant. This is not the case in any of the Powerline alternatives presented in the environmental statement. All are connected to regional power grids which obtain power from various generating sources such as Shoshone and Hayden.

29. Comment: Is there any relationship among the possible powerline routes to the proposed Occidental plant site that BLM and Public Service of Colorado are evaluating and those routes proposed by Colony?

Response: In June, 1975, Public Service Company of Colorado was granted a right-of-way and constructed a 69 KV powerline to serve the Occidental Oil Shale operation in Logan Wash. This line from Grand Valley to Occidental followed closely the Riley Gulch leg of the proposed Corridor "B". A 230 KV line built along Corridor "B" would be able to serve the needs of both Occidental and Colony.

30. Comment: It appears that a more detailed examination of the mine backfilling alternative is warranted. Further examination of this alternative is merited given that 1) revegetation appears problematical, 2) a reduction of spent shale which must be disposed of on land is desireable, and 3) probable increased recovery rates and reduced subsidence potential are advantages if properly compacted or hardening material is added. Also, "phased" backfilling, although presenting a handling problem, appears desireable. The EIS states that backfilling will cause groundwater problems and that leachates will "probably" reach Parachute Creek. This is in conflict with the description of groundwater contamination potential due to the proposed mining method.

Response: The Waste Disposal section, Underground Disposal portion, of Chapter IX has been expanded in the treatment of backfilling.

31. Comment: An alternative design for the spent shale pile should include the installation of some sort of "capillary barrier" to block the upward migration of salts brought about by surface evaporation. Research has suggested that such a barrier may be a prerequisite for successful revegetation on spent shale.

Response: Recent experiments by Colony indicate that a capillary barrier is not necessary for a successful revegetation project.

32. Comment: Alternative embankment designs (rather than just spent shale at 95 pcf) should receive consideration and stability analyses should be performed; for example, rock riprap on the embankment face is more resistant to erosion and is better with respect to water quality in the effluent; although it may be less aesthetic. Why wasn't this alternative chosen?

Response: Other embankment face designs were considered, including mixing talus with spent shale. A slope stability study entitled - Slope Stability Studies, by Dames and Moore Proposed Processed Shale Embankment, in the Colony EIA, Appendix 5, recommended the benched slope face of 4 horizontal to 1 vertical to be constructed with spent shale at 95 pcf. This would provide easy access for slope maintenance (which a rock riprap would not), minimize saturation effects, and arrest local sloughing. A mixture of spent shale and talus for the embankment face would reduce the potential for sloughing, but was not deemed necessary for purposes of overall stability.

33. Comment: The capacity of the 16-inch pipeline is sufficient to allow an increase of from 50,000 bbl/day to 150,000 bbl/day with additional pumping volume according to the EIS. However, in order to use this increased capacity, the connecting 10-inch line would have to be addressed in the final statement.

Response: The 10-inch connecting line is outside of the scope of this statement. The delivery of 150,000 bbl/day from Lisbon station southwest would require either looping or replacement of the 10-inch line. This action would have to be subjected to further environmental assessment if it is ever proposed.

34. Comment: An alternative which was neglected in the EIS was the separate treatment of wastes, other than coke, besides disposal in the processed shale pile. Alternative methods of disposal for such wastes as spent catalysts, arsenic, sludge, lime sludge, zeolite generating wastes, boiler and cooling slowdowns, etc., should be discussed in a definitive manner. Solid waste disposal of spent catalyst material poses the major problem of confining these toxic heavy metals to the area. We recommend that

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the alternative of commercial processing of all catalysts be carefully considered to mitigate this potential hazard.

Response: Colony in their EIA, Volume 1, Part I, entitled - Plant Complex and Service Corridor - 1974, listed the general compositions of the various catalysts to be used in their operation and the relative probability of each being reprocessed or disposed of with the processed shale. Reprocessing of catalysts is dependent upon, economics, a receptive market, and the environmental dangers involved in its transport. Colony has not decided which of the catalysts they will reprocess and dispose of.

35. Comment: The EIS does not make clear what type of subdivision development is proposed for Battlement Mesa. Table IV-36 indicates 1,025 people will settle on Battlement Mesa yet there is no indication of the type of housing or what community services would be included. The EIS states on page II-98 that this new development would "include motels, shopping centers, schools, etc." Such statements are not very definitive therefore the final EIS should include some specifics of the Battlement Mesa development. The population multiplier used to define total induced population should be increased from 2.5 to 3 as noted on page IV-193, thereby increasing expected total population from 4,100 to 6,150.

Response: Revision of the population estimates here would be inconsistent with projections made in numerous other parts of the report. The Colony related (incremental) population impacts were developed through the modeling done by CSU. Those projections are based on a number of assumptions which are believed to be realistic and reasonable. The features of the Battlement Mesa P.U.D. are summarized in Appendix #5. Further detail can be found in "Excerpt from: Battlement Mesa, Inc.; Planned Unit Development Submitted March, 1975." A copy is available at BLM offices in Denver and Grand Junction and copies can be obtained from the Colony Development Operation.

36. Comment: The irretrievable loss of four rare, endangered, or unique species of plants from the project area due to alteration of spring flows and seeps is disturbing, especially in view of the potential that similar projects such as Union Oil's proposed development threaten to eliminate these species from other nearby areas. The extinction of any of these

species may be unnecessary and some means of protecting them could be taken.

Response: The loss of two species will only occur at isolated locations. Portions of the proposed action have been relocated to protect these plants. Colony will maintain the species, if necessary, by transplanting or reseeding. The species will not be irretrievably lost.

37. Comment: The power requirements for the Grand Valley site are not addressed nor are the impacts of that requirement.

Response: The power requirement for the Grand Valley facilities is only 0.5 MW. This represents 1/2 of 1 percent of the total power requirement, and therefore was not considered important. Table II-1 in Chapter II displays the various facility power requirements.

38. Comment: Page 12. Finally the interrelationship if known between Colony and Union Oil's proposed project in relation to the effect on the local communities could be described in brief terms in the final EIS.

Response: BLM is not aware that any direct relationship between Colony and Union Oil exists. The proposed Battlement Mesa Planned Unit Development is large enough to accommodate residents associated with developments (employment) other than the Colony proposal. See: "Excerpts from: Battlement Mesa, Inc.; Planned Unit Development Submittal, March, 1975"; especially discussion of Phases II and III.

39. Comment: Generally, this Contingency and Response Plan is sufficient to allow adequate response to accidental discharges of oil from the proposed pipeline system. We are pleased to see the inclusion of automatic shut-off valves on both sides of the Colorado River. Major leak detection by pressure drop would appear to be sufficient. Minor leak detection by flow differences may be a problem as these instruments are generally only accurate to around three percent of measured flow. The accuracy and calibration of this equipment should be defined in the final statement.

Response: The accuracy of leak detection devices has been added to Chapter V, Water Resources.

33. U.S. Bureau of Reclamation

1. Comment: Pages II-4 and II-6 show the anticipated electric load (100 MW maximum) and alternate corridors for 230 kv lines to serve the load from Public Service Company of Colorado's or adjoining systems. The transmission line corridor studies seem reasonable for current purposes. However, there have been newspaper accounts that the Public Service Company might build a coal-fueled power plant in western Colorado to supply power for Colony and other associated development. The final environmental statement should include a discussion of Public Service's planned sources for supplying the electric power.

Response: Public Service has informed the BLM that if, and when, the oil shale industry is in full production Public Service would consider building a power plant to service them. Full production would be approaching one million barrels per day.

2. Comment: Page II-7, paragraph one--Are these the only Bureau of Reclamation responsibilities in regard to this? What Upper Colorado Region, Bureau of Reclamation, responsibilities should be stated? If specific mention of Green Mountain Reservoir is made, then Ruedi Reservoir should be mentioned also.

Response: These two questions are pertaining to the regional aspect of Ruedi and Green Mountain in oil shale development; this is outside the scope of this statement.

3. Comment: Page II-53, paragraph two--The impact chapter should have an analysis of the possible long-term adverse chemical reactions which could take place in the dump pile due to subsequent fertilizers and mineral residue runoff. The same applies to sludge from sewer effluent on page II-71 and wastewater streams on page II-72.

Response: The revised section of Chapter IV on the Water Quality of Davis Gulch contains an analysis of some of the expected chemical

behavior of the shale pile and its constituents. The emphasis is placed on the effects of the shale pile on runoff and the generation of leachate and their compositions. The revision is mostly based upon studies by Metcalf and Eddy using a small-scale shale pile and subjecting it to various physical conditions. The section in Chapter IV on impacts to Fish in the Parachute Creek valley gives an analysis of some of the possible adverse impacts related to water quality. The possible impacts of fertilizers and subsequent mineral residue runoff from the shale pile was not evaluated in the studies but is expected to be minimal compared to the volume of the shale pile and the amount of other chemical constituents.

4. Comment: Page II-62, paragraph four - States 800 acres will eventually be rehabilitated; yet page II-66, paragraph three, states that after 10 years of production, well over 100 acres will have to revegetated each year. What is to be done with the remaining area?

Response: All of the area will be revegetated at the end of the 20 year life of the project. This was discussed in Chapter V, Soils, of the DES.

5. Comment: Also, there is no information given for highway and railroad crossings.

Response: Since the draft statement, the railroad has been routed across Highway 6 & 24 just east of Grand Valley. The text has been revised in Chapter II, Railroad and Loading Docks.

6. Comment: Pages II-69-70 - A sedimentation process will be done at ponds beside the water intake structure at Grand Valley. Where will these ponds be located? More details are needed.

Response: Design has not been completed for the sedimentation ponds, however, prior to construction it will be necessary to acquire a 404 permit from the Corps of Engineers. This permit is required for dredging or filling in streams and will require maximum consideration of impacts and mitigation for this action. If there is any prospect of water quality degradation, clearance must be received from the Colorado Department of Health, Water Quality Division.

7. Comment: Pages II-75-76 - Perhaps some stipulations on the storage of fuels, LPG, ammonia, and sulfur by-products on the site should be stated or applicable safety codes stated.

Response: A reference to applicable storage requirement regulations for various substances and safety codes issued by OSHA are included in the revised section on Federal, State, and Local Requirements for Air in Chapter V.

8. Comment: Pages II-79 and II-81 - The wood transmission line structures shown are type "H" frame instead of "K" frame indicated.

Response: According to EIA Appendix 11, written by Public Service, this displays a "K" frame.

9. Comment: Page II-83, paragraph one - "Sulfur will be discharged from trucks into a lined and covered sump and pumped to a storage tank." Where will this sump, tank, and pump be located? More details are needed.

Response: As indicated in the first sentence of the section on by-product storage, all storage will be at the Grand Valley terminal.

10. Comment: Page II-89--The pipeline will parallel an existing El Paso natural gas pipeline for approximately 100 miles; not less than 15 feet close to it. Statements should be made concerning provisions against rupturing this pipeline by equipment during construction. Also, this should be mentioned in Appendix 1 on oil spills in order to make provisions for prevention of rupture of the gas line while repairing the oil line. Note that both lines cross the Colorado River and marsh together (pages III-3 and III-6).

Response: Pipeline installations this close to another is not uncommon. The Shale Oil Pipeline Section in Chapter II should suffice to dispel concern for the El Paso line. Pipeline construction techniques and methodology are well-developed and proven.

11. Comment: Page III-14, paragraph one--It is stated that two prominent intersecting vertical joint sets are present which affect subsurface water movement. This jointing should be clarified with respect to the dump pile and possible leaching of chemicals; also, as to the two dams proposed to be built concerning their water-holding capabilities, particularly since one will contain contaminants. See also pages III-33 to 36, III-138, and IV-59 to 64.

Response: The joint and fracture system is described in more detail in Chapter III in the revised Geology and Mineral Resources portion for the Mine and Plant Site section. The revised Subsurface Hydrology section in Chapter IV mentions that no effect on groundwater quality is expected "provided that leachate from the disposal pile is collected and impounded in a sealed catchment".

In regard to the water - holding capabilities of the two dams - there has been no additional information developed on dam design, other than that given in the section on Dams in Chapter II. The final design of the dams, according to Colony, will include a cutoff trench, grout curtain, or impermeable blanket as required to assure the water-holding capabilities of the dams. The above sentence will be added in a revision of the section on Dams in Chapter II.

12. Comment: Page III-160, paragraph three - The pipeline crosses approximately 2 miles of active landslide areas and creeping talus slopes. The statement should state provisions for special reinforcement or what ever is necessary to prevent damage to the pipeline.

Response: The text has been revised in the Roan Plateau portion of the Pipeline Route section of Chapter III as a result of more detailed study and field examination of the slope stability problem. The pipeline route will actually cross only about one mile of colluvial deposits at the base of the east side of Long Point. These deposits consist of slopewash and/or very slowly creeping to stable talus, and presently do not appear to pose a problem for slides.

13. Comment: Page III-166-168. The pipeline crosses Highways 6 and 50, Interstate 70, and Western Railroad. There is a lack of information on this concerning provisions or permits for these crossings.

Response: Provisions and permits for the crossing of 6 & 50, I-70, and the Denver and Rio Grande Western Railroad are addressed in Chapter II, Federal and State Action.

14. Comment: Page III-168, paragraph one - The pipeline route passes through the Valley City Reservoir site currently privately leased from the State of Utah for cultivation, but no special provisions for crossing this land are stated in the draft statement. This should be discussed in further detail.

Response: The text has been revised in Chapter III, Klondike Flats. The land is no longer used for agricultural purposes.

15. Comment: Page III-184, paragraph one - States that a new ski area with residential area and airfield, along with a recreation reservoir on the Colorado River, is being planned southwest of Rifle. Will the Grand Valley plans, proposed corridor, etc., affect any of these?

Response: The proposed Buffalo Basin ski area, residential and reservoir development is located 8 to 10 miles southeast of Grand Valley and would not be affected by the Colony developments near Grand Valley.

16. Comment: Pages IV-52-71 - These discussions should be expanded to discuss the oil shale project impacts on water supply and quality of the Colorado River as they relate to the Colorado River Basin Compacts and the Mexican Water Treaty.

Response: See the response to K. Fletcher - Environmental Defense Fund - Denver, Comment #1.

17. Comment: Page IV-58 - The impacts of withdrawing water from the Bureau's Green Mountain Reservoir should include a detailed discussion on water supply for other nonshale uses, water quality, and the aquatic ecosystem. A similar discussion should be included for impacts related to Ruedi Reservoir and the Fryingpan River.

Response: The river below Green Mountain Reservoir during water year 1974 had a high of 1,500 cfs and low of 300 cfs flow. The addition of 12.5 cfs will do very little to impact the river's ecosystem. This amounts to approximately 0.83 percent and 4.1 percent of the high and low flows. When the 12.5 cfs reaches Colony's point of diversion there will be less than 12.5 cfs removed, this removal will have a negligible effect downstream. Since Colony has junior water rights all other uses must be, with prior rights, satisfied before Colony can receive water. See response to D. McSparran-A.R.Co. - Grand Junction, Comment #2.

18. Comment: Page IV-63 - The report is unclear concerning arsenic concentration and subsequent dangers. Is it possible that the insoluble arsenic could become soluble? Is 12 pounds of soluble arsenic too risky, even before considering the insoluble arsenic? The disposal of arsenic at a rate of 530 lb/day in open dump pits, soluble or insoluble, is questionable. See also page II-35.

Response: The text has been revised in the portion on Miscellaneous Pollutants in the Water Quality of Davis Gulch section of Chapter IV. The level of arsenic in runoff from spent shale from the Metcalf and Eddy study (although it did not include the arsenic contribution from spent catalysts or process water) is presented as well as an evaluation of the additional amount of arsenic in the shale pile which would be available to runoff from process water and spent catalysts.

19. Comment: Page IV-73 - This section should state if the reservoir is on a permeable or impermeable foundation. Also, it should state the ground water table in the dam area and the anticipated seepage.

Response: This section is a direct quote from a study conducted by CH2M Hill for Colony and cited as a reference in Chapter IV, Water Resources. A description of the underlying rock strata and its permeability is given in Chapter III in the revised Geology and Mineral Resources portion of the Mine and Plant Site section. Anticipated impacts (seepage, etc.) are given in Chapter IV in the revised portion on Subsurface Hydrology in the Water Resources section.

20. Comment: Page IV-93, paragraph one - More should be said concerning possible overtopping of the two dams and pollution of the Colorado River and subsequent immediate cleanup.

Response: Overtopping of the two dams and their subsequent failure would assume disaster proportions. Colony has made no commitments concerning clean-up from this highly improbable event. It is assumed that appropriate Federal and State agencies would assume authority in the aftermath of such a disaster.

21. Comment: Pages IV-97 and 98 - It is questionable whether six inches of topsoil are sufficient for revegetation in the project area because of the properties of spent shale and its tendency to transmit salts upward due to capillarity. It is not clear if Colony is committed to covering processed shale with topsoil.

Response: See response to A. Stokes - Sierra Club - Denver, Comment #3.

22. Comment: Page IV-100 refers to extending a 69-kv transmission line from Colony's existing facilities to the proposed plant site. A discussion of the corridor for the 69-kv line should be included in Chapter II. What relationships do the 230-kv and 69-kv lines have with aesthetics, land use patterns, and raptor electrocution?

Response: The text has been revised in Chapter II, Description of the proposed section. Chapter IV discusses the impacts of powerline corridors. Impacts from a 69 kv are the same as those of a 230 kv line except on a smaller scale. With present design standards there is no problem with raptor electrocution on either line.

23. Comment: Page IV-107, paragraph five - States that "it is expected that if subsidence does eventually occur surface alteration would be a gradual, long-term process, probably without noticeable effect on the surface". But if this subsidence does occur, and does affect the surface, are there provisions for the company to correct subsequent surface drainage problems? This should be discussed further.

Response: The text has been revised in Chapter V (Mitigating Measures) in the Water Resources and Topography sections. Several corrective measures are proposed by Colony to mitigate surface subsidence, should it occur.

24. Comment: Page IV-119 discusses right-of-way 150 feet wide for the single circuit 230 kv lines. Could the width be reduced to 125 feet without undue hardship on the company?

Response: One hundred fifty feet is the usual standard width negotiated across private lands for a 230 kv line. Across Federal land it is the policy of the BLM to hold the power company to the minimum width actually required. This is something that will be worked out at the time an actual right-of-way application is filed upon selection of the final route.

25. Comment: The following comments concern the oil spill contingency and response plan appended to the draft environmental statement. Page 8, paragraph two - Locating valves on either side of streams over 100 feet wide does not seem to be sufficient. Additional valving should be supplied on both sides of smaller tributaries and should be automatic closing pressure valves, not manual.

Response: The text has been revised in Chapter V, Water Resources, Federal, State and Local Requirements.

26. Comment: Page 8, paragraph three - The potential for a 12,000 barrel afterflow would seem to be extremely high. Page D-30 - Design Features - Isolating valves should be required at all stream crossings to reduce the afterflow from the 12,000 barrel amount.

Response: There are elevational differences of over 4,000 feet. The pipe capacity is 9.5 gallons per lineal foot. Therefore, the potential of a large afterflow seems realistic. The possibilities of a large afterflow are remote. A provision has been added to Chapter V, Water Resources to enable the BLM to add this stipulation if required.

27. Comment: Page 70 - Cleanup should include washing and scrubbing of streambed materials in dry streams in all cases. Page D-26 - More detail on the possibility of oil crossing Bureau of Reclamation right-of-way and explicit methods of oil spill control in this area is needed.

Response: This measure will be accomplished in most cases, however, it is possible that washing and scrubbing could increase the environmental impacts. Colony will confer with appropriate officials to determine the appropriate actions to be taken after an oil spill.

34. U.S. Department of Health, Education & Welfare

1. Comment: More permanent alternatives be considered that would reduce water pollution, e.g., the use of a rock riprap face on the shale disposal site.

Response: This was considered, in the revised text, see Chapter II, Solid Waste Disposal, but was rejected by Colony and the BLM due to the high impact on aesthetics, and therefore was not considered as an alternative. Revegetation to more closely match the surrounding terrain and stabilize the pile was considered to be more appropriate.

2. Comment: Coke and especially heavy metal and arsenic catalysts used in the pyrolysis process be disposed of separately, with special attention directed to long-term safety and the possibility of present/future recycling and metals recovery. Since some heavy metals and arsenic have been known to accumulate in plants and animals at levels that may present human health hazards, it is important that these materials be prevented from entering Parachute Creek and the Colorado River. As these water flows are used for potable water, livestock and agricultural water, and sports fishing, it is essential to avoid decreases in water quality associated with oil shale utilization on a permanent basis extending far beyond the expected life of the processing plant.

Response: Coke will probably be stockpiled until a market is found for the material. Colony also has hopes for obtaining markets for spent catalysts. If no markets can be found for this material, it will be disposed of, as indicated in the Solid Waste Disposal section in Chapter II. Colony's commitments to protect the water quality of Parachute Creek and the Colorado River are set forth in its letter of July 19, 1976, which is quoted in part in the Solid Waste Disposal Section of Chapter II. This statement also examines other alternatives to the proposed action on handling toxic waste materials (See Chapter VIII) .

3. Comment: The draft document does not address the cumulative effects large scale utilization of oil shale deposits will have on air and water quality, wildlife, and agriculture in the Colorado River Basin.

Response: See response to K. Fletcher - Environmental Defense Fund - Denver, Comment #1.

4. Comment: Energy Costs. While the subject document addresses the various sources of energy required for oil shale utilization and the anticipated output of the facility, it would be helpful if this information were summarized in an energy input-units output section which would reveal the energy efficiency of the operation. Environmental impacts should be compared with the net energy produced rather than gross energy production.

Response: The text has been revised, Chapter VIII, Energy Output-Input Ratios.

5. Comment: Environmental Monitoring. It is recommended that air, water, and biological impact of the Colony site, should be proposed action be implemented, be monitored to quantify the environmental impacts not presently quantifiable in Chapter VI. Such studies would aid in the industry's plan for mitigating environmental impacts resulting from the proposed action. More importantly, this would provide information about pollutants and their environmental effects associated with a new, developing industry. This information could be used to assist the oil shale industry reduce the environmental impacts associated with the extraction of valuable energy resources.

Response: As outlined in the DES, Chapter V, EPA and the State of Colorado would monitor all environmental effects, where authorized by the Clean Air Act, The Federal Water Pollution Control Act as amended and other related laws. Results of these monitoring procedures would enable impacts to be quantified. The quantified impacts would assist in guiding other oil shale plants, or related industries, in design, etc.

6. Comment: Air Pollution. As previously mentioned in our comments of February 25, 1976, "Pyrolysis of the raw oil shale into hydrocarbon vapors and liquids could lead to health conditions hazardous to human health." It should be noted that some hydrocarbons, e.g., polycyclic aromatics, may be carcinogenic.

Response: The text has been revised in Chapter IV, Socio-Economic Conditions, under Effects of Air Pollutants on Man.

## 35. U.S. Forest Service

1. Comment: The effects of increased population generated by the development upon the developed and dispersed recreation on National Forest lands do not appear to be adequately covered. The emphasis in the report, page VI-15 is facility oriented and does not address the dispersed forms of recreation.

Response: The text (Chapter VI, Recreation Resources) has been revised.

2. Comment: Page V-24 also suggests that increased funding will mitigate the impacts on the recreation resource from the increased population. The mitigation should be expanded to cover other forms of mitigation possible for the impacts and effects on developed recreation as well as mitigation of impacts on dispersed recreation.

Response: Increased funding is really the only mitigating measure available since Colony has made no commitment to purchase additional recreational lands to compensate for the increased pressure on existing lands from a population increase. Actually the population increase added by the Colony project by 1985 (4,100) is not a very significant part of the normal projected population increase of 61,000 by that same date. Advance Federal planning and funding to help provide a mitigation for this increase should absorb the impact by Colony.

3. Comment: Pages VI-7 and VIII-1 mentioned that alumina and halides will be lost in the waste pile. It seems that both could be recovered from the waste pile at some future date when favorable economics will make "ore" of the wastes.

Response: The text has been revised in Chapters VI and VIII in their sections on Mineral Resources to indicate that these resources will not be "lost", but are currently not economically feasible to recover. The possibility of recovery of these minerals from the shale pile is nearly non-existent for the foreseeable future.

## CONSULTATION & COORDINATION

4. Comment: Reference page VI-5. Productivity may be lowered, but it will not be eliminated on waste areas if top soil is stockpiled and placed on these areas to aid revegetation.

Response: BLM agrees, but it depends on how and when Colony rehabilitates the area. Those areas under the shale pile and structures that may never be removed are definitely lost forever.

### 36. Federal Energy Administration

1. Comment: This proposal represents a pioneer private venture in the development of the oil shale industry. We are, therefore, encouraged to see the mining plan estimates that only 40 percent of the shale will be left as pillar supports. This is a significant improvement in resource recovery over the traditional values in coal mining room-and-pillar methods. However, it should be noted that International Nickel uses a process in Canada where they back fill in their mines with a spent ore/cement slurry. This process produces much more available ore, since pillars are not needed for support. The potential uses of this process should be explored in the EIS.

Response: International Nickel's operations in Canada are associated with the mining of base metals whose occurrence is usually in veins, thus presenting a much different mining situation and technique than layered deposits such as oil shale (or coal).

#### 2. Comment: Spent Shale Disposal

It is not stated whether a maximum weathering period for oxidation and dissipation of the generated heat is planned before the spent shale is placed permanently. A study being conducted by Denver Research Institute is currently investigating auto-oxidation in spent shale disposal piles. Auto-oxidation has, in the past, occurred in Scottish spent shale disposal piles containing an average carbon content of only 3 percent. The carbon content of the spent shale from the Colony operation may not be high enough to lead to spontaneous combustion, but may form local hot spots and slow self-oxidation.

Response: The text has been revised in Chapter IV, Water Quality in Davis Gulch, to include a discussion of the probability of spontaneous combustion from the organic material within the processed shale.

3. Comment: The draft EIS does not state whether or not Colony plans to place a clay liner beneath the planned refuse disposal area to prevent infiltration of surface waters into the surrounding environment. It also should include a statement as to whether a clay liner will be placed over the top of the spent shale disposal pile, after the desired height is attained, to minimize infiltration.

Response: Colony does not plan to place a clay liner under or over the pile. Refer to Chapter II, Solid Waste Disposal.

4. Comment: The draft EIS does not adequately discuss how the spent shale disposal dam will be maintained after the oil shale operations cease. In light of the fact, many potentially harmful contaminants and trace elements could enter the environment if the dam leaked or broke, a more thorough discussion on the maintenance of the dam should be presented.

Response: See response to A. Stokes - Sierra Club - Denver, Comment #11.

5. Comment: Finally, an estimate of the number of acres which the spent shale will cover in the Davis Gulch should be given.

Response: The spent shale will cover 800 acres in Davis Gulch. See Chapter II, Solid Waste Disposal, and numerous other sections.

### 38. U.S. Geological Survey

1. Comment Page II-29, Table II-7: How do the indicated concentrations compare with permissible discharge limits?

Response: The process water will not be discharged into streams. Process water will be used to moisturize spent shale, so it will be transported with the shale to the spent shale disposal pile. The only discharge permit required by the State will be for that water which issues from Davis Gulch Dam; this has been applied for by Colony. The predicted discharge rates for runoff from the spent shale pile containing process water is given in the Water Quality section of Chapter IV.

2. Comment: Page II-33, Paragraph 2; Page II-35, last paragraph: Leaching tests should be done on the various hydrogen unit catalysts and arsenic before they are disposed of in the processed shale pile.

Response: Leaching studies on the hydrogen unit catalysts and arsenic have not been conducted and are not contemplated by Colony because of the insignificant effect of catalysts on the composition of the shale pile. The penetration of rain and snowmelt water will be limited to the top 3 to 5 feet of the pile; therefore, disposed catalysts and arsenic will not be exposed to significant leaching action. The quantity of all spent catalysts relative to the quantity of processed shale is approximately 45 ppm (this is in addition to the composition of processed shale already in the pile). The quantity of arsenic relative to the quantity of processed shale is approximately 1 ppm. Leachate which may be produced from the shale pile will be collected behind the Davis Gulch Dam and used in the plant. See text change in Chapter II, Retorting and Upgrading, Hydrogen Unit.

3. Comment: Page II-36, paragraph 4 and Page II-39, paragraph 1: What is the nature of the contaminants generated during catalyst regeneration?

Response: Catalyst regeneration will produce  $H_2O$ ,  $CO_2$ ,  $N_2$ ,  $SO_2$ , and trace amounts of particulates and oxides of nitrogen. Scrubbing operations referred to in these paragraphs will remove  $SO_2$  and particulates.  $NO_x$  emissions will be minimized and are expected to be quite small; however, Colony does not have a quantitative estimate of  $NO_x$  yield at this time. The regeneration cycle occurs once every 2 years and will be done at a time when the facilities are shut down. This means that total plant  $NO_x$  emissions will be lower than normal during hydrogenation reactor catalyst regeneration.

The text has been revised in the section on Gas, Oil and Naphtha Hydrogenation Units in Chapter II to include the above information.

4. Comment: Page II-41, paragraph 2: What is the stability of the aluminum catalyst that is disposed of with the processed shale?

Response: The activated alumina catalyst used in the Claus units is chemically inert, mechanically strong, and even in its deactivated state will not change the processed shale embankment's structural stability or permeability.

The above sentence will be added to Chapter II, Retorting and Upgrading, Sulfur Recovery Unit.

5. Comment: Page II-43, paragraph 3: It is assumed that any coke disposed of with the processed shale will not be reclaimed even if a market can be found for this material.

Response: Disposal by uniform mixing with the processed shale is only one alternative for disposition of the coke produced. It is the only alternative which would eliminate the possibility of future recovery and sale. Sale of the coke as a by-product is a more likely alternative at this time.

The text has been revised in Chapter II, Retorting and Upgrading, Delayed Coker Unit.

6. Comment: Page II-53, paragraph 3: On what grounds can it be assumed that the quantities of organic material to be mixed in with the processed shale will not, in fact, result in spontaneous combustion or generation of toxic leachate?

Response: The text has been revised in the section on Water Quality in Davis Gulch in Chapter IV to include a discussion of the probability of spontaneous combustion and/or generation of toxic leachate from the organic material within the processed shale.

7. Comment: Page II-65, paragraph 1: How much water will have to be applied to the processed shale pile in order to leach the salts down to a satisfactory level?

Response: As discussed on page 72 and 139 of "Processed Shale Revegetation Studies, " (Appendix 6 of the Colony EIA) , greenhouse results indicate about 7 to 10 inches of water is needed to leach the salts down to a satisfactory level. A "satisfactory level" pertains to the amount of soluble salt in the plant rooting zone which would allow the growth of salt sensitive as well as salt tolerant species - this level is approximately 4 mmhos/cm. The text has been revised in the section on Solid Waste Disposal in Chapter II to incorporate the above data.

8. Comment: Page II-66, paragraph 6: An indication of some of the possible stabilization techniques that could be used if revegetation is unsuccessful would be helpful.

Response: The text in Chapter II, Solid Waste Disposal, has been revised to indicate Colony's commitments. Alternate stabilization techniques have not been designed due to the confidence in the revegetation program.

9. Comment: Page II-70, paragraph 1: What is the stability of the water treatment wastes that will be disposed of in the processed shale pile?

Response: Boiler and cooling water blowdowns and zeolite regeneration wastes are aqueous wastes and will be used as part of the processed shale moisturizing water and will be tightly bound by the shale. These wastes are stable chemically and physically.

The text has been revised to include the above information in the section on Water Treatment in Chapter II.

10. Comment: Page II-71, paragraph 1: Will the package sewage treatment plant afford primary, secondary or tertiary treatment?

Response: Text has been revised in Chapter II, Solid Waste Disposal, Sewage Treatment, to reflect a secondary treatment process.

11. Comment: Page II-71, paragraph 4: Has any consideration been given to use of dried sewage sludge as a soil amendment to facilitate revegetation of processed shale disposal areas?

Response: The text has been revised to reflect this opportunity in Chapter II, Solid Waste Disposal.

12. Comment: Page II-74, paragraph 1: Would condensation and precipitation of salty droplets in the vapor plume have any adverse effect on the vegetation within the down plume area?

Response: Water evaporated in the cooling towers will not contain dissolved salts. The visible plume referred to in the section on Water Utilization will form above the cooling tower after the vapors have cooled to their condensation point.

The text has been revised to add the above information in the section on Water Utilization in Chapter II.

13. Comment: Page II-75, paragraph 1: Has any estimate been made of the probable seepage to the ground-water system of water stored behind the Davis Gulch Dam?

Response: It must be assumed that some seepage will occur, exact quantities are unknown. There are features that will greatly negate this seepage. The reservoir will be empty 75 percent of the time, during the remaining 25 percent it will hold that amount dictated by storm frequency and intensity and by snow melt. There are no areas of compressible foundation material.

14. Comment: Page II-75, paragraph 3: Over the 20-year expected life of the project, what percent of the storage capacity behind the Middle Fork and Davis Gulch dams will be filled with sediments? If, in fact, the dams are not sold and removal operations are begun, what will be the ultimate fate of the sediment stored behind Middle Fork and Davis Gulch dams?

Response: Metcalf and Eddy conducted an investigation reported in Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks. Based on the findings of this study it has been estimated that a low 5.6 percent, a high of 16 percent, and an average of 8.6 percent of the storage capacity of the Davis Gulch dam would be filled in 20 years. Sedimentation, because of very similar soils, on the Middle Fork drainage would be essentially the same.

Sedimentation, a natural product of erosion, is presently taking place in the Davis Gulch and the Middle Fork drainages. The dams will only temporarily impede this process. In time this stored sediment will reach its destination (of this we can be sure). The timing cannot be predicted due to the unpredictable and cyclic nature of the controlling influence of weather.

15. Comment: Page II-76, paragraph 1: What type and volume of emergency containment will be provided in the tank storage area? Page II-83, paragraph 2: What type and volume of emergency containment will be provided at the Grand Valley Product Storage area? Page II-90, paragraph 5: What type of containment will be provided at the Lisbon Valley Station?

Response: As explained in Chapter V, Water Resources, the emergency containment will consist of dikes that are designed to hold 110 percent of the tankage volume.

16. Comment: Page II-83, paragraph 5: Has any consideration been given for disposal of sewage and other polluted wastes from the Grand Valley facility by putting them into the existing Grand Valley Municipal Sewage Treatment system?

Response: More attention will be given to this problem during the final design. The decision on whether or not to tie into the existing facilities will be made after the following questions are answered:

1. Will the Colony wastes overload existing Grand Valley facilities?
2. Do the Grand Valley facilities (at the time the plant is built) meet State and Federal discharge standards?

17. Comment Page II-85, paragraph 4: How do the oil shale and other economic resources beneath the offered lands compare with those beneath the requested lands?

Response: The text has been revised in the section on Land Exchange in Chapter II to include the following sentence: The value of the oil shale and other mineral resources of economic value beneath the offered lands is unknown; the final determination of value will be made by the U.S.G.S.

18. Comment: Page III-36, paragraphs 2, 3, and 4: The discussion in these paragraphs regarding average annual salinity concentration of the Colorado River is unclear. The discussion does not include salinity trends.

Response: The text has been revised in Chapter III, Water Quality.

19. Comment: Page III-130, last paragraph: The statement to the effect that no reliable resource figures for oil shale below, above, and including the remaining 75 feet of the Mahogany zone are available suggests that Colony may not have completed a comprehensive resource core hole evaluation.

Response: This information has not been published and is not available at this time. Estimates by the USGS and U.S. Bureau of Mines indicate that the remainder of the Mahogany zone contains considerable resources of oil shale ranging in grade from 15 to 30 gallons of oil per ton of shale. The text has been revised in the Geology and Mineral Resources portion of the Mine and Plant Site section in Chapter III to state the above information.

20. Comment: Page III-137, paragraph 1: The statement that "Analyses of water samples to date have not shown any lead or mercury" raises serious question regarding the sampling and analytical techniques used. Both lead and mercury are present in the Green River Formation and occur in measurable quantities in main tributaries to Piceance Creek and Yellow Creek.

Response: The text in Chapter III has been revised in the Surface Hydrology portion of the Mine and Plant Site section to indicate that very low levels of lead and mercury exist in Parachute Creek. As to sampling and analytical techniques used, "Metals were identified qualitatively using a commercially available atomic absorption spectrophotometer. Mercury was estimated by cold vapor atomic spectrophotometry. Other chemical analyses were made according to the standard methods."

21. Comment: Page III-138, paragraph 2: References to "the impervious Mahogany ledge" are misleading. The term "impervious" implies zero permeability which, in fact, is not the case anywhere in the Piceance Creek Basin.

Response: The extensively revised Subsurface Hydrology portion of the section on the Mine and Plant Site in Chapter III clarifies this concept in the description of the Parachute Creek Member.

22. Comment: Page III-139, paragraph 2: The second sentence in this paragraph states: "Parachute Creek is dependent on springs for continued flow throughout the year." This statement completely overlooks the significant role that seepage from the alluvium along Piceance Creek plays in maintaining streamflow throughout the drier parts of the year.

Response: Only part of the above mentioned sentence is quoted, the same sentence does in fact mention seeps.

The significant role seepage plays in Piceance Creek is not considered germane to Parachute Creek because they are in separate drainages.

Also seepage in Parachute Creek does not play a significant role in maintaining streamflow; as stated, springs are the primary source of dry period flows.

23. Comment: Page IV-54, paragraphs 2 and 4: What method is used to compute the maximum probable storm for purposes of designing the size of the reservoir behind the mine bench?

Response: These figures were derived from the study by Metcalf and Eddy for Colony - Hydrogeology and Surface Water Hydrology of Davis and Middle Fork Creeks, Volume I, June, 1975.

24. Comment: Page IV-59, paragraph 4: The sentence, "the artesian springs in Davis Gulch and Middle Fork valley above the canyon rim are the result of ground water which begins in the impermeable shale beds of the Parachute Creek Member" is somewhat ambiguous. Use of the term "impermeable" is seriously questioned. This term implies that the beds cannot conduct water and, therefore, would not be the source of any surface seepage or springs. Furthermore, the statement in the last sentence of this paragraph implies that downward percolation of ground water ceases at the lower Garden Gulch Member. This position is extremely questionable. In reality, ground water probably continues downward movement into the Wasatch beds.

Response: The text has been revised in Chapter IV in the Subsurface Hydrology portion of the Water Resources section. The revised Subsurface Hydrology portion in the Mine and Plant Site section of Chapter III also clarifies this concept.

25. Comment: Page IV-61, paragraph 3: The first sentence of this paragraph implies that total dissolved solid concentrations are related to erosion and turbidity. This is not the case.

Response: The text has been revised in the Salinity portion of the Davis Gulch Water Quality section of Chapter IV by the deletion of the paragraph containing the above sentence.

26. Comment: Page IV-63, Table IV-13: This table suggests out of the several elements listed only arsenic is soluble in water. This of course, is not the case. What is meant by the term "standard" in the column for concentration opposite indium?

Response: Many of the elements listed in Table IV-13 are soluble in water. The amount of soluble arsenic is mentioned in Chapter II. Therefore, a mention of its solubility in Table IV-13 is misleading, the table has been revised.

Indium is used as an internal standard in spark-source mass spectroscopy. Because of its presence as a standard, it cannot be measured in the sample. Indium is a very rare element and, if it occurs in oil shale at all, would be less than 0.1 ppm.

The above information is used in the revision of Table IV-13, Chapter IV.

27. Comment: Page IV-65, paragraph 2: The phrase, "the conversion of shale to the fine dust," seems to imply that the TOSCO process would reduce all feed shale to fine particulate matter. This conclusion is questionable.

Response: The text has been revised in Chapter IV in the Metallic Elements portion of the Davis Gulch Water Quality section.

28. Comment: Page IV-68, paragraph 3: Is the quantity of arsenic produced in terms of tons per day or per year?

Response: The text has been revised in Chapter IV, Water Quality of Davis Gulch, Miscellaneous Pollutants, to state 108 tons per year.

29. Comment: Page IV-70 and 71: The observation made in this paragraph regarding ground-water contamination needs further explanation.

Response: The text has been revised in Chapter IV, Water Resources, Davis Gulch.

30. Comment: Page IV-86, All paragraphs: Does the discussion regarding probable flood flow as a result of dam failure include the large quantity of sediment that would be picked up by such a flow?

Response: The discussion relates only to the volume of water during surge flow (s) . The volume of sediment incorporated in the flow from erosion in the first several miles below the dams would slowly decrease as deposition would begin to occur where the valley gradient decreases, near the confluence of the West and East forks with main Parachute Creek. Deposition of the contained sediment would occur from this point all the way to the Colorado River .

40. Energy Research and Development Administration

1. Comment: It is our opinion that the discussion relative to reclamation needs further elaboration. Since the document states that there is sufficient topsoil available to cover only about one-third of the spent shale, and since all of the alternative possibilities except return to the mine also require topsoil, it is not clear how the revegetation program will proceed. If topsoil is not required, we would like to see research data to support that fact.

Response: This has been expanded in Chapter II, Solid Waste Disposal.

2. Comment: The discussion presented on predictions relative to air quality appears to be reasonable given the state-of-the-art and we think it was prudent to point out the uncertainties of the calculations. However, one point which was probably not considered, because of no existing Federal standards, is the possibility of acid rain in and around the area as well as at distances of about one day's travel in the air. The acid rain transport possibility could have an adverse impact on water quality and should be considered in the final statement.

Response: The existence of conditions to produce an acid rain would be practically impossible because of the composition of emissions and their controls, the dry climate, and the plant location. The text has been revised in Chapter IV in the Sulfur Dioxide portion of the Climate and Air Quality of the Dow West Property section, to address the low probability of the occurrence of acid rain in the area.

3. Comment: Another concern which we have is the unanswered question as to the level of arsenic in the runoff water. It appears from a technical standpoint that this method of disposing waste arsenic is questionable. It is stated (pages II-85, IV-65, IV-68) that solid arsenic is to be deposited on the spent shale pile at the rate of 531 pounds per day. We realize that only a part of this arsenic is in soluble form, but we would like to see some estimate of the level in the runoff water and what potential impact this would have.

Response: The text has been revised in the portion on Miscellaneous Pollutants in the Water Quality of Davis Gulch section of Chapter IV. The level of arsenic in runoff from spent shale from the Metcalf and Eddy study (although it did not include the arsenic contribution from spent catalysts or process water) is presented as well as an evaluation of the additional amount of arsenic in the shale pile which would be available to runoff from process water and spent catalysts.

4. Comment: However, the proposed pipeline right-of-way will be on natural (SIC0 resource lands for over half of its total length of 194 miles. The pipeline design provides for a future rate of 100,000 bbl/day and a maximum operating pressure limited to 885 psi. The statement contains considerable data on line drainage volumes for full line rupture but does not recognize the possibility of drainage due to relatively small pipeline leaks.

Response: As stated in the DES, the possibility of small pipeline leaks will be extremely low during the life of the pipeline because of its construction design which is above safety factors required by the Department of Transportation. A 125 percent above operating pressure hydrostatic test will eliminate any defective pipe seam and internal corrosion will not occur because of the high quality of the product oil which will be moved. The most probable cause of a pipeline rupture will be through damage by an outside party (as stated in Chapter IV, Pipeline Corridor Stream).

5. Comment: Since this pipeline will cross the Colorado River and natural (sic) resource lands, the automatic detection capability of relatively small pipeline leaks would be desirable from an oil spill standpoint.

Response: Attention is directed to Appendix I, Oil Spill Contingency Plan (pages 25-27) and Chapter V under Federal, State, and local Requirements.

6. Comment: Some discussion would be helpful with regard to the unmined oil shale. To what extent would its recovery be impaired if spent shale is returned to the mine?

Response: The text has been revised in Chapter IX, Waste Disposal, to include this information.

7. Comment: Why will only the top of the Mahogany zone be extracted? Who has rights to the remaining oil shale? Some discussion is needed regarding the portion of the resource to be left.

Response: The text has been revised in Chapter II, Mining, to explain that the 60 foot proposed mining section in the upper part of the Mahogany zone is the highest grade (approximately 35 gallons of oil/ton) within the zone. The TOSCO II process is most effective using this high grade of oil shale. Colony will retain rights for the remaining oil shale. All mineral rights are in private ownership except for approximately 300 acres of "Federal windows" within the Dow West property. It is therefore Colony's prerogative to decide what will happen to the remaining oil shale resource on their property; the oil shale left in place will probably never be mined.

8. Comment: A brief paragraph on page II-7 alludes to a "spill prevention countermeasures plan" for storage facilities, which must be filed with the Environmental Protection Agency (EPA). Some additional discussion is suggested regarding the regulatory basis for the plan and what it covers. Such information may be obtained from EPA Regulation Title 40 Code of Federal Regulations, Part 112, Oil Pollution Prevention, which establishes requirements for the preparation and implementation of Spill Prevention Control and Countermeasure Plans (SPCC).

Response: The text has been revised in Chapter II, Federal Actions, also Chapter V, Water Resources, has been expanded on this subject.

9. Comment: The implication, in the first paragraph on page V-2, that the proposed facility is required by law to meet Federal regulations covering ambient levels of nitrogen oxides, carbon monoxide, and hydrocarbons is misleading. Ambient air quality levels established by EPA set the ambient air quality levels which the states must attain through the promulgation and enforcement of appropriate emission standards. It is these emission standards that the proposed facility must meet.

Response: In some cases the State of Colorado has set no standards for several types of air pollutants. Nitrogen oxides, carbon monoxide, and nonmethane hydrocarbons are examples pertinent to Colorado. In this case, the National Ambient Air Quality Standards set by EPA, acting under authority of the Clean Air Act of 1970, represent the maximum allowed concentrations.

10. Comment: Mitigation of sociological impacts by Colony are not considered in Chapter V nor are they considered in Chapter IX as an alternative to "unavoidable" impacts. The possibility of Colony presenting a financial plan which provides economic assistance for "front-end" capital funding is a viable alternative and should be discussed. In addition, a plan should be presented for cooperating with communities in providing for required services and societal demands.

Response: Revision of Chapter IX, Planned Unit Development, reflects progress made with respect to the evolution of the Battlement Mesa P.U.D. proposal is still viewed as an "alternative", its implementation will provide at least partial mitigation of the socio-economic impacts addressed in this comment.

With respect to "front-end" funding, 37 1/2 percent of the oil shale bonus bid moneys received by the Federal government have been transmitted to the State of Colorado in accordance with Federal laws and regulations. The companies involved (including A.R.Co.) feel, that to some extent, "front-end" monies have already been made available.

11. Comment: Chapter IX is essentially a collection of information on various alternatives. There is no analysis and no presentation or discussion of the rationale for selecting the proposed actions from among the various alternatives. For example, Table IX-3 contains energy requirements for various modes of transportation. Was this the basis for the selection? If so, why present the extensive set of data relative to the pipeline? What is needed is a concise set of statements giving the primary reasons for selecting the set of proposed actions rather than the other options.

Response: The purpose of the Chapter on alternatives is to compare the possible alternatives with the proposed action. The BLM did not select the proposed action, it is Colony's proposal. By comparing the alternatives with the proposed action the decision maker can select the best overall action. The alternatives chosen for analysis were those the BLM felt were technically feasible.

The table that compares the energy intensiveness for various modes of transportation has been revised. The modes of transportation selected for display are those that have been studied and present a comparison for the public and the decision maker. See response to D. Bradley - Moab.

12. Comment: Various monitoring features are utilized as preventive means for reducing leak frequency such as pressure monitoring and associated alarms and visual inspection. It is considered that additional information relative to pipeline automatic monitoring and control (pages 25 and 26 of Appendix 1) would be helpful in determining the level of leak detection capabilities. For example, the pressure sensitivity of the pipeline pressure deviation alarm would be of interest. Reductions in pipeline pressure could possibly be related to projected pipeline leakage rates. Data concerning the level of sensitivity and accuracy of the flow balance deviation alarm could be added to Appendix 1 such that it could reflect the level of leak detection capability of the automatic monitoring and control system.

Response: The accuracy of the leak detection devices has been added to Chapter V, Water Resources.

#### 41. Colorado Division of Water Resources

1. Comment: The discussion in the Surface Hydrology subsection, page III-133, of the Mine and Plant Site section does not address water supply, present depletions, future depletions, and water rights for the Parachute Creek watershed as was similarly discussed for the Colorado River in the Regional Setting section. Without the knowledge of these factors, a total evaluation of the impact of the Colony Operation cannot be made, and obviously, has not been made.

Response: The text has been revised in Chapter III, Mine and Plant Site, Hydrology.

2. Comment: It is stated that the impoundment and use of water will reduce the average annual runoff of Parachute Creek near Grand Valley by 2.5 percent. It is also stated that additional flow reductions may occur from drying up of springs and from pumping of wells (page IV-55). Again, no evaluation is made of the impact of this flow reduction on other vested water rights. As a result of the mine dewatering operations using wells, the depletion to the Parachute Creek average flow is estimated to be 420 acre feet per year (page IV-60). Again, the impact of this depletion upon other water users is not evaluated or considered.

Response: Release of water to protect original water rights is discussed in Chapter II, Water Supply, Dams; Chapter IV, Water Resources, Surface Hydrology; and Chapter V, Water Resources.

3. Comment: In Chapter V, Mitigating Measures, of the Water Resources Section, all discussion is directed towards water quality. As I have stated above, the Colony Operation is subject to Colorado water law and any potential injury to vested water rights must be mitigated by providing a plan of augmentation approved by the Division Water Court. Thus, Chapter V should be revised to include the mitigating measures that Colony will undertake.

Response: This is one reason Colony has requested additional water from Green Mountain Reservoir. They will not impinge on downstream or senior water rights. See Chapter V, Water Resources.

#### 42. Colorado Division of Wildlife

1. Comment: Page II-62, 4th paragraph. The full 800 acres of processed shale pile must be planned for 6-inch topsoil application, - not just 200 acres. Revegetation of permanent and stable plant cover of the processed shale without topsoil is highly questionable, if not impossible.

Response: See response to A. Stokes - Sierra Club - Denver, Comment #3.

2. Comment: Page II-65, 2nd paragraph. Details of irrigation are missing. If continuous irrigation of entire area under reseeding is intended, rates of application, lengths of application (including time extensions planned for after 20-year plant life), and water source adequacies are some items not given attention here and, in part, only very meager in the last paragraph, bottom of Page II-66 following.

Response: The exact details of the irrigation system have not been designed. Colony has considered the maximum rates of irrigation in their water consumption rates. Colony has adequate quantities of water to irrigate the revegetated area as long as necessary.

3. Comment: Page IV-136, 3rd paragraph; and page IV-143 RAPTORIAL BIRDS. No mention is made of the possibility that peregrine falcons nest in Parachute Creek canyon and what additional human disturbance might mean to their welfare. Direct destruction of cliff habitats might be minimal, but more is certainly involved than that activity.

Response: Peregrine falcons are mentioned in Chapter III, Terminal Facilities, Fish and Wildlife, as having been sighted in Parachute Creek and are possible residents. Impacts on the peregrin falcon have been presented in Chapter IV, Fish and Wildlife.

4. Comment: Page IV-137, 3rd paragraph. Possibilities of deer-auto collisions on the access road and/or elsewhere on service corridor roads can be minimized through proper application of animal control techniques already available from Division of Wildlife research. Cooperation between Colony and the Division on highway deer control is urged, if not planned for definitely now (see Page IV-151, 1st and 2nd paragraphs for additional base information).

Response: Colony, and the BLM, are quite concerned with this problem. However, there are not any regulations or laws concerning this matter. As a matter of protecting wildlife, and more importantly, human lives, Colony will consult with the Division of Wildlife when designing protective devices.

## 43. Colorado Geological Survey

1. Comment: Potential slope stability problems have not been addressed fully enough in this EIS, particularly those slope stabilities related to cuts and fills associated with road and pipeline construction. In addition, the slope stability of the spent shale pile during and after placement.

Response: Slope stability does not appear to be a problem at the present time. The BLM specifications for the pipeline and roads will be designed to prevent slope failures. The majority of the roads will not be in areas where slope stability appears to be a problem. See Water Resources and Soils sections in Chapter V. The slope stability of the shale pile and Davis Gulch Dam was discussed in Chapter IV, Dam Failure.

2. Comment: Related to the slope stability problems is the control of drainage throughout the project area. Of particular concern is the adequacy of the culvert under the spent shale. No calculations showing the expected peak flows and sediment content were provided.

Response: The culvert will be designed to accommodate the maximum storm. However, it is not certain that this culvert will be necessary. Colony will fill the side drainages first and the mainstem may not be utilized. The remaining processed shale may be placed back into the mine. Maximum peak flows are presented in Chapter IV, Dam Failure.



# **GLOSSARY**



## GLOSSARY

Acre. 43,560 sq ft or approximately 1/4 mile x 33 ft or a 208 ft square.

acf. Average cubic feet.

Air curtain; Stream of air to prevent cross-ventilation, its purpose being to confine dust.

Algal limestone. A limestone composed largely of remains of calcium-secreting algae or in which such algae serve to bind together the fragments of other lime-secreting forms.

Alluvial water source. Water obtained from deposits laid down in association with present river systems.

Alluvium. Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semi-sorted sediments.

Alcalite, Analcime. A colorless or white, transparent to translucent, hydrous, sodium-aluminum silicate mineral,  $\text{Na}(\text{AlSi}_2\text{O}_6)\text{H}_2\text{O}$ .

°API. The standard American Petroleum Institute method for specifying the density of crude petroleum (in degrees API).

Aquifer. Stratum or zone below the surface of the earth capable of producing water as from a well.

Aquifer communication. The passing of water from one aquifer to another aquifer.

Aquitard. A formation restricting the downward migration of subsurface water.

AUM, AUM's. Abbreviation for Animal Unit Month/Months. The amount of forage required to sustain a cow and calf, five sheep, or six to seven deer for one month.

## GLOSSARY (Cont.)

Avian. Pertaining to birds.

Bag house. Chamber in which exit gases from roasting, smelting, and calcining are filtered through membranes (bags) which arrest solids.

bbl/day. Barrels (42 gallons) per day.

Benthos. Organisms that live on or in the bottom of bodies of water.

Bitumin. All those hydrocarbons which are soluble in carbon disulfide.

Blowdown. The release of water from a fire-tube boiler at the beginning of a workshift, thereby disposing of sediment that may have accumulated.

Bottoms oil. The heaviest oil from the pyrolysis fractionating unit.

Braided. Branched and rejoined, producing a netlike pattern, as with some streams.

Btu. British thermal unit.

Cation. Any positively charged ion, radical, or molecule.

cfm. Cubic feet per minute. A standard capacity of performance measurement for compressors.

cfs. Cubic feet per second.

Chert. A compact, siliceous rock consisting of chalcedonic and/or pealine silica, and of organic or precipitated origin.

Cobalt molybdate. A catalyst used in petroleum technology in reforming and desulfurization.

cohs. Coefficient of haze.

Cp. Centipoise (unit for measuring viscosity).

## GLOSSARY (Cont.)

Cracking. A process in which relatively heavy hydrocarbons (fuel oils, naphthas) are broken up into lighter products (gasoline, ethylene) by heat.

CRS. Colorado Revised Statutes.

dba. Decibels.

Downwarp. A broad, generally shallow, geological downfold.

Endangered species. Those species in danger of extinction throughout all or a significant portion of their range.

Eocene. An epoch of the Tertiary geologic time period generally 40 to 60 million years ago.

Ephemeral. Short-lived, transitory.

Extirpation. To remove utterly; destroy totally; exterminate; do away with.

Eyrie. Aerie, aery, eyry. Lofty nest of any large bird.

Fissile. Term applied to bedding in rock (i.e. shale) which consists of laminae less than 2 mm in thickness.

Flared. Unburned gases which are oxidized at the top of a stack.

Fluvatile. Of or pertaining to rivers; growing or living in streams or ponds produced by river action.

Formation. The primary unit in lithostratigraphy consisting of a succession of rock strata useful in mapping or description.

## GLOSSARY (Cont.)

Foul water. A solution of sodium carbonate or bicarbonate loaded with  $H_2S$  and other impurities absorbed in washing.

Geomorphology. The branch of both physiography and geology that deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of landforms.

gpm. Gallons per minute.

gr/dscf. Grains per dry cubic feet at standard conditions.

Gum. Any of various viscid or sticky discharges (oozes) without definite shape from plants, hardening on exposure to air, and soluble in, or forming a viscid mass with water.

GVW. Gross Vehicle Weight.

HDN. Hydrodenitrogenation.

HDS. Hydrodesulfurization.

Heel. Any material remaining in a vessel after removal of main portion of the contents.

High pressure bullets. High pressure storage tanks of bullet shape used to store LPG and ammonia.

In situ. As used in this FES - the process(es) involved in the in place removal of shale oil from its parent material (oil shale) without mining it.

Interbedded. Occurring between beds or lying in a bed parallel to other beds of different material.

Ion. An electrically charged atom, radical, or molecule formed by the loss or gain of one or more electrons.

## GLOSSARY (Cont.)

Kerogen. The solid, bituminous mineraloid substance in oil shales which yields oil when the shales undergo destructive distillation.

Kiva. A large room in a Pueblo Indian dwelling used for religious and other purposes. The room is usually round and partly underground.

kv. Kilovolt (1,000 volts).

kva. Kilovolt-ampere.

kvh. Kilovolt per hour.

kwh. Kilowatts (1,000 watts) per hour.

lb/hr. Pounds per hour.

Lenticular. Shaped approximately like a double convex lens. When a mass of rock thins out from the center to a thin edge all around, it is said to be lenticular.

Lithified. Turned to rock; consolidated or a loose sediment which has been indurated.

Long ton. 2,240 lbs.

Looping. Parallel construction of a pipeline or powerline similar to one already in existence.

maf. Million acre-feet.

Marlstone. A hardened (indurated) mixture of clay materials and calcium carbonate (rarely dolomite), normally containing 25% to 75% clay.

## GLOSSARY (Cont.)

Mature streams. A stream which has reached a state of equilibrium with its bed characteristics.

Mega watt. Million watts.

Member. The division of a geologic formation, generally of distinct lithologic character or of only local extent.

mg/l. Milligrams per liter.

mmhos. One thousand mhos; mho is the practical unit of conductance equal to the reciprocal of the ohm.

mm. Millimeter.

Naphtha. A colorless, volatile, liquid petroleum distillate (esp. a product intermediate between gasoline and benzene) used as a solvent, fuel, etc.

National resource lands. Those Federally owned lands (formerly called Public Domain Lands) under the exclusive jurisdiction and management of the Bureau of Land Management.

Offered lands. Private land offered to the government in a private exchange under Section VIII of the Taylor Grazing Act.

Olefins. Unsaturated hydrocarbons of the ethylene series (for example ethylene and propylene) having the general formula  $C_n H_{2n}$ .

On stream. Put in operation.

Pediment. Gently inclined erosion surfaces carved in bedrock and generally veneered with fluvial gravels.

Permeability. In soils, that quality which enables it to transmit water or air.

Pibal. Pilot balloon which responds to wind velocities it encounters during its rise.

## GLOSSARY (Cont.)

pH. The negative logarithm of the hydrogen ion activity; denotes the degree of acidity or of basicity of a solution.

Phreatophyte. A deep-rooted plant that obtains its water supply from the water table or the layer of soils just above it.

Physiographic province. Region of similar structure and climate that has had a unified geomorphic history.

Piceance. Pronounced "Pee' ance".

PPM. Parts Per Million.

ppmv. Parts per million by volume.

Productivity. Having the capability of generating or producing abundantly.

psi. Pounds per square inch.

psig. Pounds per square inch gauge (absolute pressure less that exerted by the atmosphere).

Pyrolysis. Decomposition of organic substances by heat.

Quenching. Rapid cooling.

RVP. A measure of the vapor pressure of a sample at 100°F.

Scarp. A highly linear cliff or steep slope along the margin of a plateau, mesa, terrace, or bench; produced by faulting or erosion.

Scree. A heap of rock waste at the base of a cliff or a sheet of coarse debris mantling a mountain slope.

Seismicity. Pertaining to characteristics of, or produced by, earthquakes or earth vibration.

## GLOSSARY (Cont.)

Selected lands. National resource (public) lands selected by the applicant in a private exchange under Section VIII of the Taylor Grazing Act.

Short ton. 2,000 lbs.

Sour water. Water which contains hydrogen sulfide and ammonia.

Steam reforming. The reaction of steam with a light hydrocarbon, such as methane, to produce a gas rich in hydrogen.

Stratigraphy. The branch of geology which treats the formation, composition, sequence, and correlation of the stratified rocks as parts of the earth's crust.

Stream day. Average water flow in a day.

Surge. A vessel used to temporarily store solids or liquids resulting from sudden increases in pressure or flow of these materials.

Syncline. A fold or trough in rock strata in which the layers dip inward from both sides toward each other.

Tectonics. Study of the broader structural features of the earth's crust, especially folding and faulting.

T.D.S. Total Dissolved Solids.

Tuff. A rock formed of compacted volcanic fragments, generally smaller than 4 mm in diameter.

μ. Micron - a unit of length equal to one-millionth of a meter.

μgm/m<sup>3</sup>. Micrograms per cubic meter - used as a measure of air contaminant concentration in air quality studies.

Undulating. Rising and falling like waves.

# **APPENDIX**



APPENDIX 1  
OIL SPILL CONTINGENCY PLAN

(The Oil Spill Plan has not been edited to correct phone numbers, etc.. Colony will update the Plan to existing standards prior to filing. Filing must be accomplished within six months after the pipeline is constructed.)

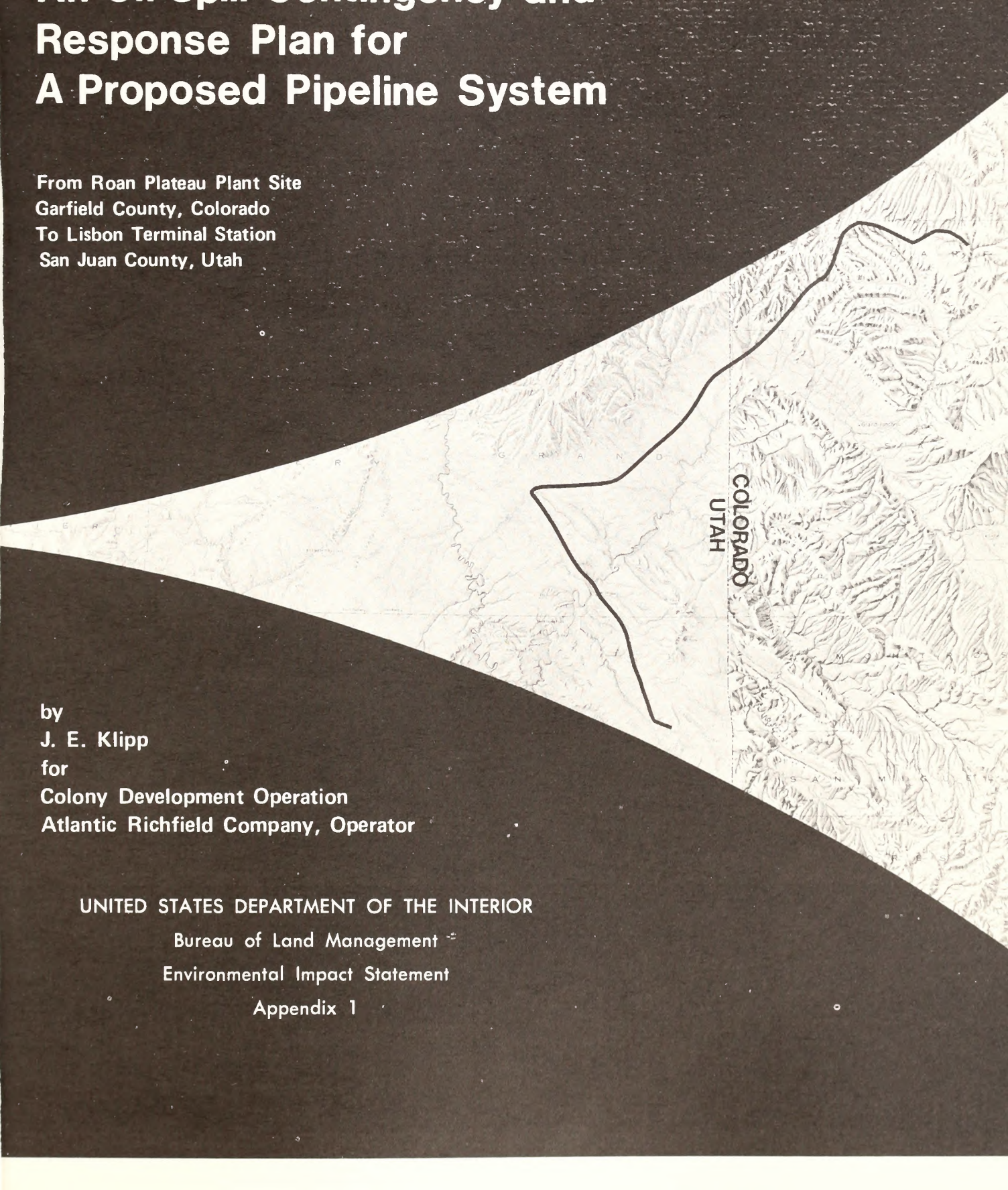


# Response Plan for A Proposed Pipeline System

From Roan Plateau Plant Site  
Garfield County, Colorado  
To Lisbon Terminal Station  
San Juan County, Utah

by  
J. E. Klipp  
for  
Colony Development Operation  
Atlantic Richfield Company, Operator

UNITED STATES DEPARTMENT OF THE INTERIOR  
Bureau of Land Management  
Environmental Impact Statement  
Appendix 1



COLORADO  
UTAH



AN OIL SPILL  
CONTINGENCY AND RESPONSE PLAN  
FOR  
A PROPOSED PIPELINE SYSTEM  
FROM  
ROAN PLATEAU PLANT SITE - GARFIELD COUNTY, COLORADO  
TO  
LISBON TERMINAL, SAN JUAN COUNTY, UTAH

by  
J. E. KLIPP

Prepared for  
COLONY DEVELOPMENT OPERATION  
ATLANTIC RICHFIELD COMPANY, OPERATOR

December 1973

This report is only one of many that make up the Colony environmental planning effort pertaining to a commercial oil shale facility in the Parachute Creek area of Colorado.

## ABSTRACT

This oil spill contingency plan was prepared for the proposed fuel oil pipeline to be constructed from Colony Development Operation's shale oil processing complex, Parachute Creek, Colorado to Lisbon Station, Utah. The plan addresses spill prevention measures, organizational and equipment requirements to assure spill response readiness, and appropriate response actions for various potential spill situations.

Although the plan has been developed and this report prepared prior to construction, personnel staffing and operational start up, it is designed to be a working plan easily adapted to post-start up conditions. The plan is broad in its coverage of contingency planning requirements and detailed in regards to oil spill response actions for the specific conditions along the actual route.



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## I. Contingency and Response Plan Background

### A. Purpose and Scope.

This plan was developed in conjunction with the route selection, engineering design and environmental analysis phase of planning this pipeline system. It covers both the contingency planning concept for the organization and preparatory measures to be taken prior to a theoretical spill occurrence and the response actions that could be employed in the event that an accidental spill should occur from the proposed system. It is a prevention plan as well, in that it is a management and operating tool. The plan can be used to develop an awareness of oil spill clean-up policies and procedures. It also can minimize the impact of a spill by initiation of effective actions should a spill occur.

The pipeline route and the environmental and ecological factors such as hydrology, soils and vegetation which are pertinent to oil spill contingency planning were studied in relation to the immediate and off-route areas which might be exposed to any oil that could conceivably leak from the pipeline. The contingency and response plan was subsequently developed after this analysis of the wide variety of conditions that might be encountered along the route and then in more detail to certain specific but generally applicable situations relative to this geographical region.

The plan is general for contingency planning requirements but specific as to applicable response actions and provides a conceptual program to be implemented by the pipeline management prior to initiation of operations of the proposed pipeline and Colony's oil shale complex.

Development of a plan at this time informs the involved federal and state agencies and interested public of ARCO Pipe Line Company's (APL) intended response to any oil spills that might occur from its facilities and fulfills any regulatory or procedural requirements for the proposed facilities.

#### B. Description of the Pipeline System.

The pipeline system which will be operated by APL and as covered by this plan follows a route from Colony's proposed oil shale processing complex on Roan Plateau in Garfield County, Colorado to a Lisbon Station pipeline terminal in San Juan County, Utah. The surface distance traversed is to be about 185 miles and will generally follow the route shown in Figure 14. The length of the line will be approximately 195 pipeline miles.

The oil to be transported in this pipeline will be a low sulfur fuel oil product having a gravity of about 44° API and with the physical and chemical characteristics shown in Table 1.

The pipeline will be constructed of four weights of 16" API 5LX, X-52 line pipe with strengths of various sections designed to provide adequate factors of safety as covered in Section I-C in a discussion of preventative design features. Due to lower elevation of the Lisbon

Table 1. Characteristics of Hydrotreated Shale Oil

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Gravity ° API	Approx. 44°
Specific Gravity	0.805 @ 60° F
Viscosity	5 Cp @ 50° F
Pour Point	50° - 60° F
RVP	6.6 psig.

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Station, a relatively low pumping pressure of about 470 psig is required to transport the product from the plant site to the terminal at the initial rate of 50,000 B/D. The design provides for a future rate of 100,000 B/D and a shipping pressure of about 805 psig with a booster pump station south of Moab operation at about 325 psig. The maximum operating pressure will be limited to 885 psig at Parachute Creek pump station.

The pipeline will be continuously buried to depths required by DOT regulations in regards to below the surface specifications under roads, railroads, and river crossings and over much of the route, depth of burial will be at least three feet below the original surface. Block valves will be spaced at designed intervals along the line. These valves will allow isolation of sections of the line and be full opening to allow the passage of line scrapers and wall thickness gauges. The entire pipeline will be coated, wrapped and cathodically protected.

The originating pipeline pump station will be located in the storage and loading facilities area of the proposed shale oil processing complex. The pipeline pump will receive the product at a suction pressure of about 50 psig, and boost it to the pressure sufficient to deliver it under steady state, pressure vs. flow, conditions to the Lisbon Station or intermediate pump station, as might be required later. The line temperature at the originating station will be about 90° F and within a few miles the product will approach and remain at approximately the subsurface ambient temperature along the route. Design has been based on an average temperature of 50° F. Delivery will be made into storage

tanks at the Lisbon Terminal and/or delivered into Union Oil of California's pipeline system.

### C. Preventative Design Features.

Cleaning up after oil spills is sometimes a very costly, difficult and time-consuming operation. Spill incidents are therefore not only prevented to eliminate any possibilities of environmental impact but also to conserve a valuable product, maintain normal operations and avoid the expense of clean up. The added attention being given to prevention of leaks in the engineering design studies and the proposed capital investments to incorporate preventative design features will reduce leak frequency and minimize the volume spilled from any incident. The preventative design and operation features of this pipeline system are:

1. Route selection to evaluate critical areas.
2. Engineering design including variable wall thickness of pipeline section, cathodic protection measures, coating and wrapping selection, extra valve placement, remote valve closing, pumping station shutdown, etc.
3. Construction practices including depth of burial, pipe handling, welding, ditch preparation and backfill procedures, road and stream crossings, on-scene inspection, etc.
4. Monitoring and alarms for pressures, flow rates, transfer volumes and line losses plus visual inspection scheduling.
5. Personnel education in the areas of operating procedures and contingency planning.

## 1. Route Selection

The route selection not only considered the minimization of environmental impacts from the construction and routine operational phases but also locations along the route that might be associated with oil spill occurrences. Areas of particular concern are those susceptible to a high potential for corrosion, hazardous geotechnical areas (3), or damage from outside parties. In addition, since the contingency plan was written during the period for evaluating the final route, (1) there was an opportunity to study factors related to the consequences of a spill along the alternative routes. Environmental background data pertinent to an impact of an oil spill along the pipeline route was collected by UEAC (2)\* in their Environmental Setting study and addressed in Woodward-Envicon's (12) EIA on the proposed subject.

## 2. Engineering Design

This pipeline system is being designed so as to prevent all leaks that can be avoided by foreseeable causes including failures due to excessive pressure, weakening of the pipe due to corrosion, temperature and other stress overloads. The pipeline system consists of the line itself, the required pumping stations, and the storage facilities at Lisbon.

### a. Pipeline System

The design of pipelines for strength is controlled both by regulations and standards of engineering design calculations based upon controlled pipe strength specifications. This line was designed in compliance with the Department of Transportation regulations (8)

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\* See References

Title 49 CFR, Part 195 and all pipe, valves and material to be used will have been manufactured to controlled specifications. The pipe grades, wall thicknesses and electric flash welding processes\* will be specified to conform to the American Petroleum Institute's specifications and quality controls for high test line pipe. The grade and wall thickness of pipe were selected so as to provide safety factors over and above the maximum pumping pressure to be allowed and the static pressure due to fluid heads over the variable elevation route. Figure 15 shows the pressure design features and the line profile hydraulic gradient. The DOT requires certification of testing after installation and this pipeline will be tested to a pressure of 95% of the minimum specified yield. In this case, the test pressure will have tested the pipeline to a minimum of 125% over the maximum pumping pressure to be set by relief valve for the line.

The pipeline will be coated and wrapped using a coal-tar base enamel with a fiber glass reinforcing wrap and an outer wrap of 15# coal-tar impregnated, glass-reinforced asbestos felt. The use of the above-described coatings are employed even though the line will be protected by induced cathodic protection to prevent leaks. This is a required practice in modern pipeline design that is employed as a means of minimizing leak frequency. The pipeline is to be protected by rectifier and buried anode devices placed at sites along the route as determined by detailed

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\* Includes double submerged arc process

soil analysis of the corrosion potential. These methods of coating and wrapping in conjunction with cathodic protection have proven to be significant preventative design features on modern pipeline systems.

DOT regulations cover valve placement along the line. (Pt. 195.260, Title 49 Ch. I.) Of special significance are the valve locations on either side of streams over 100' wide. These valving regulations will be complied with, and as an extra control measure, valves at the Colorado River will be designed so they can be closed remotely from both the OCC and the originating pump station.

In addition to those valves required by regulations, additional valves will be placed along the line at planned locations. The placement and procedures to close the valves are designed to limit leakage from gravity flow. When the valves are closed in the event of a leak, the maximum afterflow is restricted to about 12,000 bbls. Only about 3% of the line has a potential for a 10 - 12,000 bbl. afterflow leakage. (Table 4, App. D) Natural depressions or lows in the line's profile as well as resistance to flow from soil covering the line, site and location of the hole in the pipe, etc., will all tend to reduce the actual volume that will flow from a leak. The valves will be manually-operated block valves or reverse-flow check valves and will be installed so that they will be below the surface and protected by fencing from accidental destruction. In remote areas provisions will be made for access under all weather conditions including helicopter and snowmobile or snowcat access.

Regulations (195.410) also require that the pipelines be well marked, specifically at public road crossings, railroad crossings and along the line. As noted in Appendix D, attention will be given to line marking in areas of high construction activity.

For the initial installation rate of 50,000 B/D, only the originating shipping pump station is required. This will be an attended but not continuously manned station at the plant processing complex site; however, the station will be under automatic control from the Operating Control in APL's Independence, Kansas headquarters.

Manual overrides will be incorporated into the station's control system and safety devices to prevent overpressuring of pumping equipment and the pipeline are provided as a spill prevention measure. Sump tanks will be provided to store oil from relief valves and periodic inspection of the pump station will insure against small on-site leaks going undetected.

The tank at the delivery station at Lisbon will be diked to contain 110% of the 120,000 barrel tank capacity so as to contain any product leakage and will be provided with emergency relief venting to protect against tank overpressuring and equipped with level alarm and shut-in controls to prevent overflow of oil.

Periodic inspections will provide monitoring and maintenance backup.

#### b. Construction Practices

Just as the design features are controlled by regulations of the DOT, so are many of the construction practices. These regulations are designed to prevent the leaks and in conjunction with hydro-

static testing of new lines, the potential leak problems following construction can be normally be eliminated.

c. Monitoring of the System

Various monitoring procedures are employed as preventative means for reducing leak frequency such as pressure monitoring and alarms plus automatic high pressure shut down devices; internal corrosion measurement potentials by the use of coupon testing and initiation of a corrosion inhibitor injection program as the situation indicates; external corrosion monitoring by electrical measurement testing; and visual inspection as the situation arises to be able to inspect pipe that has been buried. Additional monitoring for leak detection is employed to keep the volume of a leak to a minimum. This procedure will be discussed in connection with alerting procedures in Section II-A.

d. Personnel Education and Review of Operating Procedures

Formal training sessions will be conducted for those new personnel assigned to the operation of the pipeline system. Operating procedures as they pertain to prevention of conditions and incidents leading to spills will be periodically reviewed so as to eliminate human and equipment operation error as the cause of a spill.

In this same vein of preventative training measures, key and auxiliary personnel who would have responsibilities for response and cleanup will be trained in the procedures and techniques to be employed in the event of a spill as per the contingency

plan. Spill response training approaches are further discussed in Section XIII.

#### D. Potential for Spills

This Contingency Response Plan has been prepared to be used as a planned but emergency type of procedure since pipeline spills are not predictable for an individual system as to time, frequency or location. Statistically, the volume spilled from pipeline systems of the type proposed has been a small percentage of the products carried. The preventative design features to be employed on this pipeline system further minimize the possibility of leaks due to corrosion and outside destructive forces in comparison to many of the older systems reporting spills.

Geotechnical studies show this route is in a low seismic risk area; however, certain areas of landslide and erosion potential have been identified. This pipeline is to be designed to prevent leaks from seismic and landslide influences and to minimize the frequency of all types of leaks and the volume of any single spill. The preventative design features previously discussed and factors just mentioned suggest a low potential for leaks from this pipeline; however, this contingency plan provides backup to respond to a spill should one occur.

Data accumulated on spills that have been reported to the DOT(9) from pipelines carrying liquid petroleum products show that over 50% of all spills occurred as a result of either external corrosion or from equipment working in the area causing a leak or pipeline rupture.

Most of the corrosion leaks are reported as occurring in systems installed over twenty years ago. The next most frequent cause was from defective pipeline seams. This later category accounted for between 5 and 10% of all the spills reported to the DOT. Those systems using electric-flash welded pipe were credited with only 10% of the failures in defective pipeline seams.

Statistics compiled by the EPA and the states of Colorado and Utah also reflected the number of leaks from pipelines carrying petroleum products. Of the total leaks reported from all causes, about 5% in Colorado and approximately 10% from the six states in EPA Region VIII in the last two years were on pipeline systems; however some of these include oil field gathering type facilities.

As mentioned in the Preventative Design Features Section, the proposed system will be constructed with electric-flash welded pipe, cathodically protected, coated and wrapped, buried to a depth of three to four feet in critical areas and well marked along the route; especially in areas of possible construction and farming activity. The low equipment activity over 80% of the route further minimizes the chance of a spill. Spills can occur along the line, at pumping stations, or at associated tank farms. Approximately 90% of all leaks could be expected to occur along the line. The Contingency Plan, however, must anticipate response to a leak from any part of the system. As will be described later, the pipeline system has been analyzed by planning areas. In addition, general and specific response actions are discussed which

are applicable to the system in total and some of the most critical areas to spill response are covered in greater detail.

Spills from this system could occur under the following conditions and situations:

1. Winter or summer.
2. On arid land or into a major river.
3. Dry gulches or small intermittent streams.
4. In a populated area or an isolated region.
5. From a few gallons to 12,000 barrels in volume.
6. In an area of some farming.
7. Where moderate vegetation or light tree cover is present.
8. Where fish or non-ranging animals are present.
9. Potable water supplies or industrial water uses can be come involved
10. Areas not frequented by many people or having small animal populations.
11. In inaccessible area.

Although no spills are expected, response to accidental spills under the above conditions will be anticipated.

#### E. Regulatory Responsibilities

While APL assumes responsibility for its operating facilities and any leaks which will occur, prevention and clean up of oil spills are controlled by Federal and State laws and regulations. This Contingency Plan has been written to take into account those laws and regulations

which are applicable to oil spills from this pipeline.

The basic laws providing authority to responsible government agencies associated with the pipeline route and offsetting land and water areas are:

- (1) Federal Water Pollution Control Act Amendments of 1972, Sec. 311, Public Law 92-500, October 18, 1972. (10)
- (2) Colorado Senate Bill No. 390 Water Quality Control, Article 28 of Chapter 66, July 6, 1973.
- (3) Utah S. B. No. 142 Reporting Spills or Discharges Which May Cause Pollution of State Waters.

In support of the above laws and subsequent regulations, the regulatory agencies have developed response procedures; and governmental actions will be set in motion by a spill from the proposed line. Recognition of these actions and requirements for reporting and clean up have been incorporated into this Contingency Plan. The regulatory agency actions and procedures are contained in the following publications:

- (1) National Oil and Hazardous Substances Pollution Contingency Plan, proposed August 13, 1973. (7)
- (2) EPA - Region VIII Pollution Contingency Plan, Nov., 1971. (4)
- (3) Colorado Health Department - Procedure and Directory for Reporting Spills of Oil and Hazardous Materials. (6)
- (4) Utah State Division of Health - Hazardous Spills Directory, September, 1972 (5)
- (5) Memorandum of Understanding - FR, Vol. 36, No. 244, December 1971

This Contingency Plan anticipates that in certain instances, such as

a large or critical area spill, the USCG, EPA, Colorado Department of Health and Utah Division of Health Contingency Plans might be partially activated. Response centers have been set up by the various agencies and are noted as follows:

- (1) USCG - 2nd District  
St. Louis, Missouri
- (2) USCG - 12th District  
San Francisco, California
- (3) USCG - 11th District  
Los Angeles, California
- (4) EPA - Region VIII  
Denver, Colorado
- (5) Colorado Department of Health  
Denver, Colorado
- (6) Utah Division of Health, Department of Social Service  
Salt Lake City, Utah

A detailed listing of the responsible agencies and other governmental groups supplying support to the regional response areas in Colorado and Utah that are traversed by the pipeline route have been extracted from the EPA's Region VIII and State Response Plans and are included as Appendix A.

If the spill condition warranted regulatory agency response, the coordination and any direction that might be required of the Federal pollution control effort would be accomplished through an On-Scene Coordinator. The On-Scene Coordinator is the executive agent predesignated in an applicable response plan or in certain instances as assigned at the time of a spill. In some Federal plans, it is indicated that the on-scene authority may be delegated to local,

State, or other Federal officials than the primary responsible agencies of the EPA or USCG.

In the case of a spill under the control of the responsible party from whose facility the oil came, the Federal plan might be expected to assume the following general course of action:

- (1) In the event of a spill of oil, the first responsible Federal official on the site, from any of the response team agencies, would assume coordination of activities under the applicable response plan until the predesignated On-Scene Coordinator becomes available to take charge of the operation.
- (2) The On-Scene Coordinator would determine pertinent facts about a particular spill, such as the nature, amount, and location of material spilled, probable direction and time of travel of the material, resources and installations which may be affected, and the priorities for protecting them.

When EPA intervention is required the on-scene coordination and follow up would likely be conducted by a spill emergency team as per the following summary of applicable items from EPA's Region VIII Plan: (5)

#### Regional Spill Emergency Team

Regional spill emergency teams are comprised of program representatives of Enforcement, Operations, and when appropriate, Research and Development. Individuals serving on the team are predesignated and

one person is appointed to serve as the ReSET Field Coordinator.

Specific missions of the team are:

- (1) To advise the Regional Director of any violations of Federal statutes and to recommend prosecution of such violations, where appropriate.
- (2) To provide, within available resources or through other agencies or contractual services, aerial and surface surveillance utilizing visual, photographic, and remote sensing techniques.
- (3) To conduct special studies and investigations which will include ecological surveys, physical and chemical analysis, and evaluation of environmental conditions as such studies and investigations relate to the mission of the team.
- (4) To gather and safekeep evidence, facts, and arrange for the taking of statements from witnesses in the event prosecutions are warranted.
- (5) To coordinate the personnel from other agencies in the DOI when such agencies respond to spill pollution episodes in the navigable waters of the United States.
- (6) To notify other State, Federal and local jurisdictions as appropriate and in consonance with the Regional Contingency Plan.

In the event of a spill, the information on the spill will be immediately evaluated by the on-duty Field Coordinator. Decisions as to subsequent actions will be made on a first priority basis in order that the most complete and timely response is made to the incident.

The Field Coordinator would be responsible for:

- (1) Activating ReSET and responding, on-scene, to a significant spill incident.
- (2) Determining when Research and Development support, either from the Regional program or the Edison Laboratory, is required.
- (3) Providing field coordination of Enforcement, Operations, and Research and Development to the Regional Director when the Regional Response Team of the Regional Contingency Plan is activated.
- (4) Coordinating follow-up actions, as appropriate in the programs of Enforcement, Operations, and Research and Development, following any spill incident.
- (5) Advising the Regional Director on specific equipment, research, and additional personnel needs pertaining to any specific spill episode.
- (6) Activating pre-established labor hour contracts for special studies if the spill incident exceeds the immediate response capability of the region.
- (7) Coordinating all press or other news releases through the Regional Director.
- (8) Coordinating reports to the Region and Headquarters regarding a spill episode.

#### Coordinated Response

Regional and subregional overlap - When a pollution incident

*overlaps regional and subregional boundaries, the Contingency Plan for any affected region or subregion will be activated.*

It is possible that in the area covered by this plan, both within Federal and State groups, responsibilities could overlap. APL's intention, as stated in a summary of policies, is to cooperate with all agencies involved.

#### F. Policies and Practices

As a responsible operator, APL has assumed certain internally controlled responsibilities in conjunction with prevention and clean-up of oil spilled from its operating facilities(11). In addition, it recognizes the requirements of laws and regulations controlling its operations and its policy is full compliance in this regard. A summary of some policies and operational practices are listed as a means of emphasizing and clarifying the prevention and response action indicated in this contingency plan.

1. Oil spills can have an impact upon certain aspects of the ecological systems that can be associated with the pipeline routing and result in technical, legal and public relations repercussions for APL. Therefore, it cannot be emphasized too strongly that APL's incentive in regards to oil spills is to be directed at preventing their occurrence. Advanced design and construction practices, good housekeeping, conscientious equipment maintenance and adherence to controlling operating procedures are considered as the best insurance against spills.

2. If, in spite of the best care, accidental spills do occur, they will command the immediate coordination of efforts of predesignated, responsible employees. In some situations, specific assistance from outside agencies and contract sources may be requested and advice will be welcomed. The oil spill contingency plan is prepared to help APL, its associated companies, and outside parties personnel in reacting by quick and effective response to the problems presented by the accidental spill occurrence.
3. APL's goal in regards to oil spill clean up is to limit environmental impacts while insuring that the safety and health of its employees is protected. It further desires to minimize the aesthetic impacts that sometimes result from oil spilled on water, land and structure surfaces.
4. APL will assume its appropriate responsibility and retain authority for direction of clean-up operations for spills occurring from the facilities operated by APL or their affiliates. In carrying out its responsibilities under applicable laws and regulations, their representatives will cooperate fully with the various governmental agencies having authority, responsibilities, or interest in the procedures employed and end results to be obtained.
5. APL shall make every reasonable effort to prevent, contain and clean up oil spills it is responsible for and shall cooperate with others toward such ends. Sometimes the potential liability for damages resulting from an oil spill can be large; and while APL expects to be subject to honoring its liabilities, it is

necessary that it monitors the information released by its employees.

APL's policy is to cooperate with the public and press, but in doing so, it will follow the procedures for release of information in the following subsection G.

#### G. Public Relations

The policy of cooperation with appropriate agencies and disclosure to the press is designed to provide realistic and accurate information releases at as early a time as possible. This general policy is expanded and clearly established ahead of any incident to prevent any confusion of policies and procedures. If the incident so warrants, as per the case of a major critical spill, information briefing sessions will be set up for government agencies and subsequently for press representatives.

##### 1. Authorized Spokesman

The Operations Director, his alternate, or the Pipeline Manager will act as official spokesman to the news media. However, depending upon the nature of the circumstances, the assigned Public Relations Assistant will be authorized to answer inquiries and prepare information releases. In any situation only one manager or at his direction his public relations assistant will clear and issue information releases for public distribution. All such local or on scene information releases will be reported to the Public Relations Manager.

In order to prevent the publication of distorted versions of incidents, it is important that accurate information be released as early as

possible to news media. Once distorted accounts of an incident are reported, it is virtually impossible to overcome the resulting damage to the Company and the Industry.

## 2. Inquiries to Employees

Public Relations procedures instruct all employees who might receive an inquiry for information from the news media, to direct such inquiry to the assigned Public Relations contact. If authorized to do so, the Public Relations Assistant will handle the request for information. Otherwise, he will refer the request to the Operations Director or the designated representative cleared to pass on all public information releases.

Company personnel receiving a telephone call for information will take the reporter's name, telephone number and newspaper or station. The reporter will be told that a Company spokesman will contact him as soon as possible. The information will be relayed to that person responsible for insuring that Public Relations is notified of such requests for information.

## 3. Reporters in Field

If a reporter visits field offices, he will be received courteously and will be assisted in making telephone contact with the person authorized to make official statements. The Operations Coordinator or the Public Relations Representative at the scene may authorize news photographs within the limits of safety, common sense, and good taste.

#### 4. Information Releases

Information released to news media should be specific and accurate.

Releases should contain the following information as applicable:

1. Name and location of Company installation.
2. Brief description of what happened, but no details as to cause.  
State that the cause of the occurrence is being investigated and evaluated, and if and when available, appropriate details will be furnished.
3. Brief description of damage to Company property, including a statement as to the effect of that occurrence on normal operations, if any.
4. Report efforts to control the spill; clean-up measures taken and planned; types and quantities of equipment used; manpower involved.
5. Describe special efforts to protect property and wildlife.
6. Specific name of fire departments, police units, civil defense, oil spill control agencies and other individuals and organizations who rendered assistance so that proper credit may be given.

#### 5. Statements Requiring Special Clearance

No statement shall be made relating to any of the following unless specially cleared by Legal Counsel and the Public Relations Manager:

1. Speculations concerning the cause or liability for the spill.
2. Estimates of the damages expressed in dollars.
3. Estimates of the length of time required for clean-up or its costs.

4. Assurances that property, ecology, or anything else will be restored to normal.
5. Rebuttal to adverse public statements made by governmental authorities.

Names of any people severely or fatally injured will not be released until their next of kin have been notified.

#### 6. Incorrect Published Statements

If inaccurate statements or unfounded speculations are published, the following steps may be followed:

1. Provide the source with correct information. Arrange for persons involved to visit the scene of the occurrence to confirm the Company's statements.
2. Avoid public rebuttals; request news media to issue corrections and amendments of incorrect reports.
3. Do not rebut statements by scientists unless a comparable authority or source can be used to authenticate the Company statement.

## II. Discovery, System Shut Down and Notification

### A. Internal Procedures

#### 1. Discovery and System Shut Down

The detection of leaks and pre-planned system shut down are considered to be part of the standard operating procedures for APL's personnel and this system will be provided rate, pressure and volume monitoring equipment to assist the operators in this important function. Alarms on deviations or failure of equipment or communication will be used as an alert to abnormal conditions and pre-set controls will automatically shut down the system. In addition to the equipment employed for leak detection, visual inspection is practiced on a scheduled and routine basis.

#### a. Automatic Monitoring and Control

Continuous monitoring for the detection of leaks and continuity of the communication system will be done at the OCC (Operating Control Center) in Independence, Kansas, where line parameters are displayed at regular intervals and can be called up on manual demand.

Large leaks can be indicated within a few seconds by pressure or flow deviation and small leaks by volume balance of oil entering and leaving the system each hour. Early detection of a leak and rapid shut in of the pipeline system can limit the maximum volume which will leak from the line.

(1) A Pressure Deviation Alarm is signaled whenever a measured pressure at a station or monitoring site deviates from a pre-set variation from normal or predicted operating pressures. This alarm will indicate large leaks near stations or monitoring sites. Pressure increases above a map point but below the maximum design pressure would automatically shut in the system.

(2) The Flow Deviation Alarm would be signaled whenever a flow measured at a station deviates from a pre-set value by more than a small per cent of a pre-rated output.

(3) A Flow Balance Deviation Alarm is signaled whenever the difference in flow rate out of any station as compared to the flow rate into the next station deviates from a stored value by more than a fraction of a per cent of normal line throughput.

(4) A computer calculation of Line Volume Balance is made each hour by comparing the volume of oil entering the system against the volume of oil delivered out of the system. Whenever there is a cumulative imbalance of more than a pre-set value, an alarm is sounded. Major or cumulating deviations are considered cause to shut down the system.

b. Periodic Manual Monitoring

(1) Visual inspections of the Pumping and Delivery Stations will be made daily to verify equipment condition

along with other required functions for normal operating maintenance.

(2) Aerial patrols will be utilized to detect any signs of potential danger. Aerial surveillance of the entire route will be made about once per week. Aircraft are to be tied into the communication system to insure prompt reporting and action on detected leaks.

(3) In the event that inclement weather prohibits aerial inspection for periods longer than one week, Surface Patrols will be made to ascertain dangerous conditions that may be developing along the pipeline. Most of such an inspection will have to be made on foot as no inspection road will be maintained along the pipeline route. Patrols will be provided with portable VHF equipment for both reporting and safety reasons.

## 2. Notification

When a spill or a strong indication of a spill is observed by any APL or Colony personnel, procedures for alerting action and reporting are set in motion. The magnitude or sensitivity of the area of spill occurrence will determine the reporting procedure as to participation of units involved in the response action and the level of authority to be notified.

Required reporting to government agencies will follow the standard procedures as outlined below.

a. Reporting to Required Agencies

Federal regulations and both the states of Colorado and Utah require immediate reporting of oil spills that enter streams or could pollute either surface or ground waters. In addition, the DOT requires reporting of spills in excess of 50 barrels. For all practical purposes the scope of the combined regulations requires reporting of any volume spill that could cause water pollution.

Once the spill has been confirmed by the pipeline operating superintendent and action is initiated to respond to the leak situation and control the spill, he will notify the EPA and appropriate state offices listed below:

1. Region VIII Office of EPA in Denver - 303/837-3880.
2. Colorado Department of Health, Denver - 303/388-6111.
3. Utah State Division of Health - 801/328-6146.

In the event that the pipeline operating superintendent cannot be reached, his alternates, as shown in Figure 1., will assume his responsibility of reporting to regulatory agencies.

b. Internal Reporting

Regulations require spills be reported to the outside agencies immediately, and this sequence will follow a set procedure.

However, internal reporting and alerting procedures can vary with the size of spill and significance of response requirements in respect to the timing and level of alert. For small spills,

PIPELINE SYSTEM - ALERTING AND RESPONSE RESPONSIBILITIES

<u>NAME</u>	<u>TITLE</u>	<u>PHONE</u>
1. <u>Responsible Supervisor for Pipeline System</u>	Pipeline Superintendent	
2. <u>Operators on Duty to Initiate Alert and Action Procedure</u>	Supervisor at OCC*	
	Oil Movement Supervisor at OCC	
	Station Operator at Plant	
	Chief Delivery Man at Lisbon	
3. <u>Order of Responsibility for External Reporting</u>	Pipeline Superintendent	
	Pipeline Manager	
	Plant Manager	
4. <u>Personnel to be Notified for Response Initiation</u>	Pipeline Superintendent	
	Pipeline Manager	
	Plant Manager or Designated Oil Spill Control Supervisor	

\* OCC - Operating Control Center - Independence, Kansas

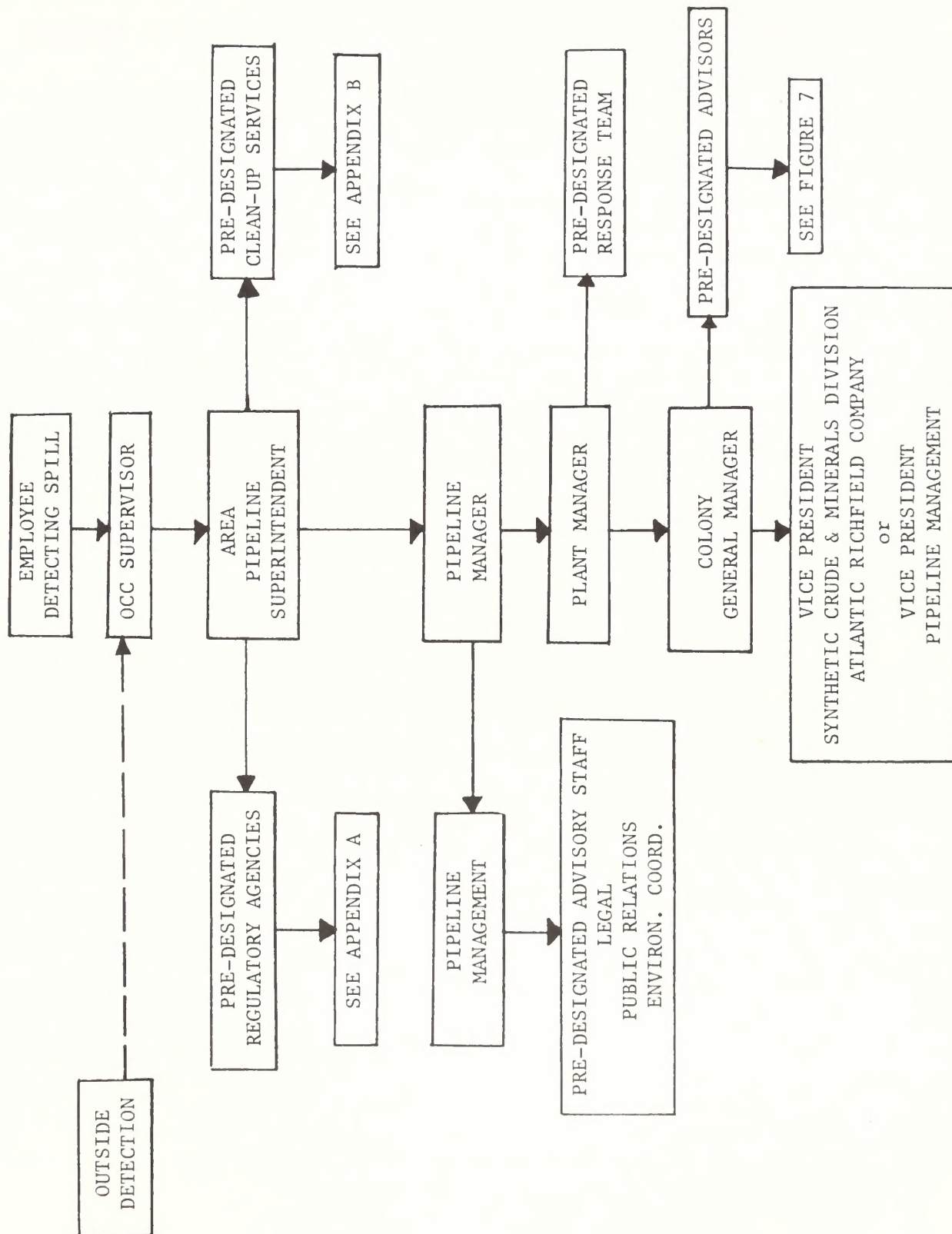
say less than 20 barrels, where clean-up is somewhat routine and natural entrapment has occurred, the internal alert and response action may be confined to the level of the Area Pipeline Superintendent. On the other hand, if a large spill of 5 to 10 thousand barrels occurred in a sensitive area adjacent to the Colorado River, then levels up to executive management and the full capabilities of APL and its affiliates could be called into action.

The action, then, is somewhat dependent upon the levels of responsibility that can be assumed by a supervisor or the capability of his organization to cope with the situation. Due to the number of people who are to be notified and the necessity for the simultaneous initiation of response actions by the local supervisors, a delegation of alerting is required. This progressive alerting and action procedure is best demonstrated by Figure 2, Notification and Alerting. The titles used in this Figure and elsewhere in the Plan must be considered subject to some revision since the final structures of the organization and the responsibilities of the plant and pipeline personnel have not been determined. The concept, however, is readily adaptable to the final organization without weakening the plan.

Notification of those personnel who stand by to assist the local pipeline personnel compliment in the event of a spill may best be accomplished in two phases. This is especially significant when this assistance is to be provided from distant sources. The first phase normally would be to put pre-assigned personnel on the

FIGURE 2

NOTIFICATION AND ALERTING



alert and to transmit information, and the second would be to call for on-scene assistance after assessment of the requirements for response. This second phase is covered in detail in the Response Action section.

Certain information pertinent to planning response to a spill occurrence needs to be gathered and reported internally. This is generally covered in the following listing:

1. The time a leak started or was first observed.
2. The location where the spill occurred and the present spread movement of oil.
3. An estimate of the amount spilled or rate of release if it is continuing.
4. The environmental conditions: i.e. temperature, wind direction and speed, wave action, currents.
5. A description of the area likely to be affected such as water sources, river banks, properties, wildlife areas, etc.
6. The circumstances leading to spill.
7. The action being taken to respond to spill and by whom.
8. The agencies or other persons notified up to this time.

When a spill is reported by an outside source, as much of the above information as is known would be requested.

A spill is investigated as a result of an internal notification, the information is gathered for the Pipeline Superintendent to assist him in his reporting responsibilities.

## B. External Procedures

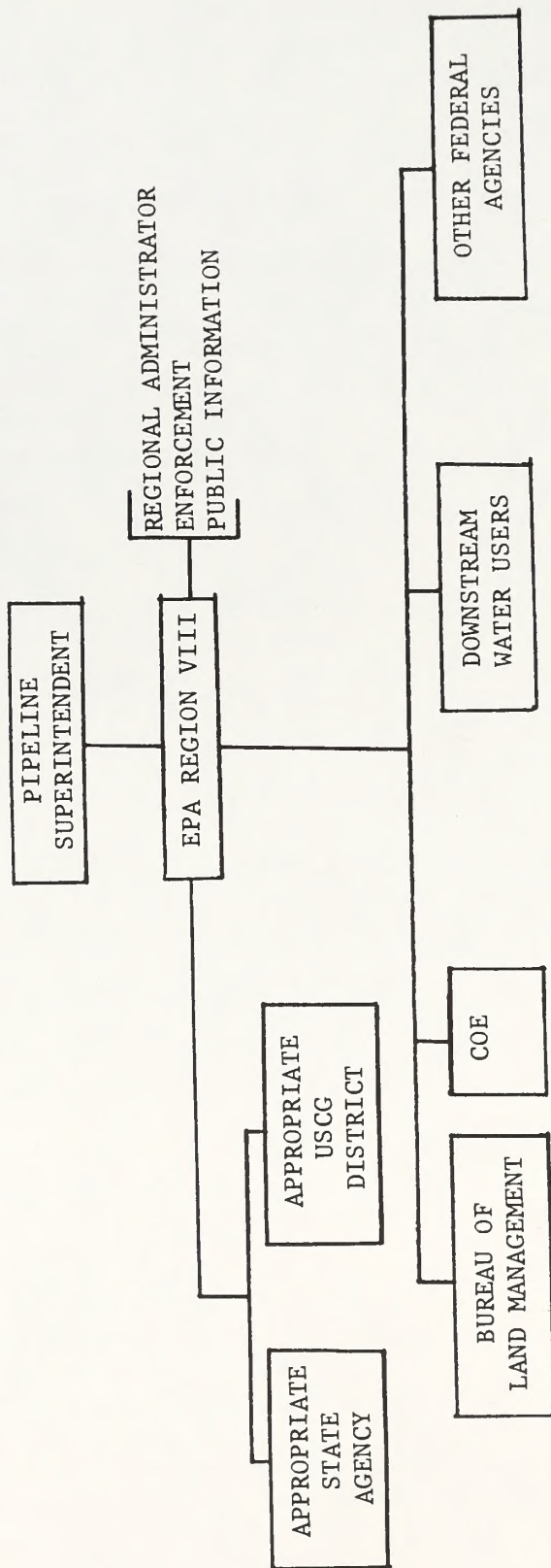
As explained under Internal Reporting Procedures, regulations require the responsible operator who has had a spill to report it to one or more agencies as dictated by the circumstances covered in the Federal and State acts. Should he not report a spill, he would be subject to a penalty for failure to notify. An effective external reporting procedure is therefore essential for compliance with the acts. In the case of the Water Pollution Control Act of 1972, an operator might also be subject to a civil penalty under certain circumstances even after he has reported as required by the act.

The U. S. Coast Guard has been designated the appropriate Federal agency, as are the Water Pollution Committee in Utah and the Water Pollution Control Division in Colorado. By arrangements between the USCG and EPA, a report to the EPA Region VIII is considered as compliance with the Federal Reporting Requirements. Both the States of Utah and Colorado require separate reports to the appropriate agencies for a spill in their State area as does the DOT.

In addition to the specific agencies cited above, various other Federal and State agencies can have an interest or responsibility dependent upon the conditions surrounding a spill. Alerting of agencies other than those noted above, except any required reporting to the DOT, will be assumed to be taken care of by the external procedures set out in Figures 3, 4 and 5. APL will report directly to the DOT as required and may also directly contact outside

# FIGURE 3

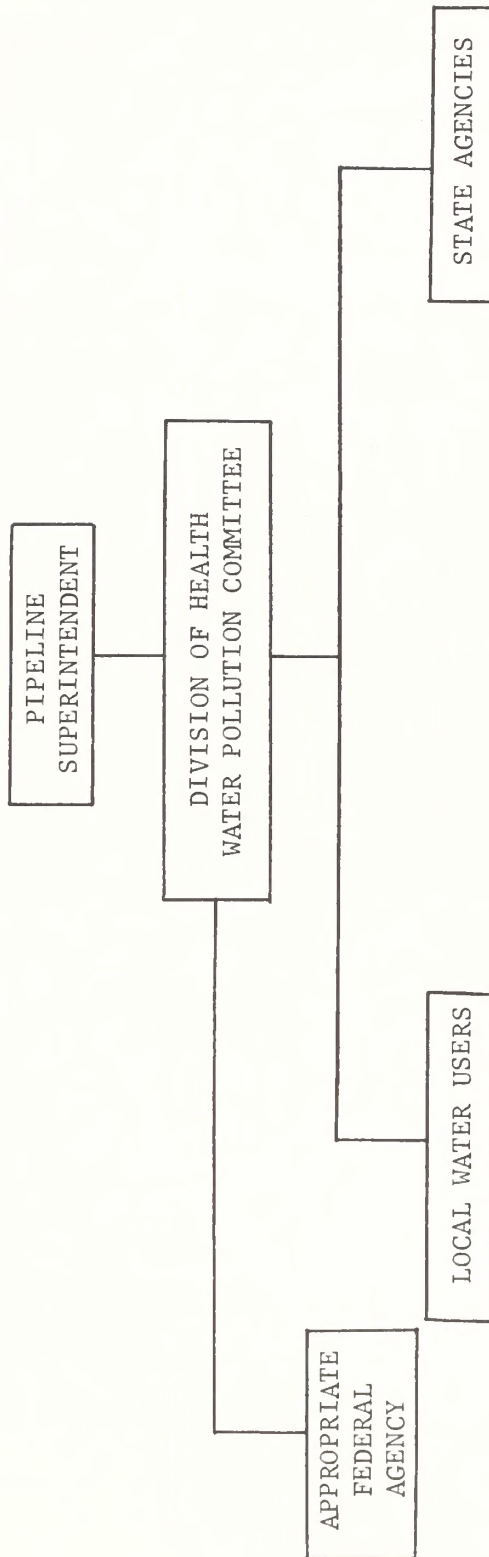
## GENERAL ALERTING PLAN EPA REGION VII



1. NOAA Weather Service
2. DOD Agencies
3. DOI Agencies
4. HEW
5. OEP
6. Others

FIGURE 4

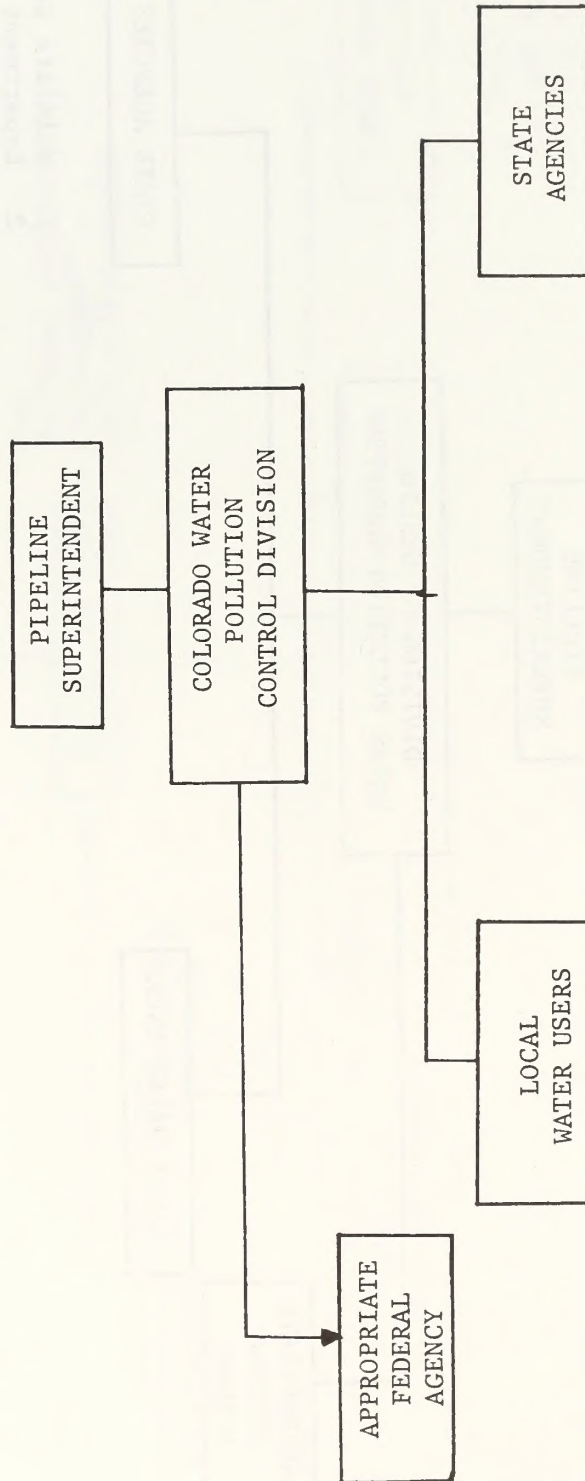
UTAH ALERTING PLAN



1. Wildlife Resources Division
2. Department of Highways
3. Highway Patrol
4. Parks and Recreation Division
5. Others

FIGURE 5

COLORADO ALERTING PLAN



1. Division of Health
2. Conservation Department
3. State Police
4. Communities
5. Others

agencies, such as the Park Service or local fire departments as the situation dictates.

It will not be the normal practice for the APL representative making the initial report to speculate as to the cause of the spill since such reflections might subsequently be misconstrued in any litigative action resulting from any unavoidable spill damages.



### III. Response Action

As related in the preceding section on discovery and notification, the response action to minimize a leak and initiate containment and clean-up activities will begin essentially simultaneously with reporting and alerting procedures. As the situation dictates, various alternative actions will be indicated to the trained and responsible supervisors in charge of the pipeline operations. These are reflected in the following guidelines and procedures; however, it is emphasized that a spill is an accidental occurrence. Initiative and the ability to adapt these guidelines to a specific time, place and set of conditions will be key factors in carrying out the Contingency Plan effectively. This plan of action is readily translatable into effective response by Colony and/or APL, even though the personnel who would carry out the indicated actions have not yet been assigned to the project. Indoctrination and training of assigned personnel are discussed in Section XIII.

#### A. Action Plan Format

The following general actions will be taken in the event of a pipeline leak or break causing an oil spill:

1. Stop the leak and minimize loss from the pipeline.
2. Initiate emergency mobilization and set up the internal alert along with the external alert as necessary.
3. Dispatch aerial and ground patrols to ascertain location of

the leak.

4. Set up a communications network to cover the emergency situation.
5. Dispatch emergency crews and equipment for repair, containment and clean-up. They will concurrently stop the leak at its source and begin containment of the escaped oil.
6. Recover the spilled oil.
7. Clean up the spill area.

A wide variation of situations and conditions will dictate the final response action required and levels of responsibility that might be activated in the event of accidental spills from this proposed pipeline. Some general indications of response and responsibilities are given to illustrate the course of actions to be taken. These are covered in Sections IV through IX while guidelines and specific methods of response are covered for areas along the pipeline route in Appendices C, D and E. However, response to all spills may be expected to start with about the same actions and these are described in relation to personnel responsibilities.

#### B. Initial Phase of Action

Actions to minimize a spill shall be taken as soon as a spill is indicated or has been reported. This will normally start at the OCC. The Operating Supervisor at OCC shall confirm the spill and the circumstances pertaining to the reason and nature of the leak. He

is authorized to shut in the pipeline in order to stop a leak and then notify the Pipeline Superintendent who will normally be the man to set the appropriate response plans into action.

Any suspicion or confirmation of a pipeline leak will initiate immediate cessation of operations and the closing of any block valves on either side of the leak until conditions are brought under control. If a spill occurs at the Pump Station or Terminal, all loading or unloading pumps shall be immediately shut down, the trouble area isolated by closing of valves, alarms activated and all other protective measures taken.

The responsible company employee at the scene of a spill would take the following action:

1. Observe and render judgment as to:
  - a) The danger to human life or property.
  - b) Whether or not the spill can be readily stopped or brought under control by his actions.
2. If any human life or property is in danger, take prompt action to alleviate such danger.
3. If the spill can be stopped or brought under control by some direct action on his part without undue hazards, then he should take prompt action to do so.
4. Having made these on-the-spot assessments or taken these immediate actions, he will initiate the pre-planned alerting procedures previously described. The general response actions to be initiated by the Pipeline Superintendent will automatically be set in motion.

### C. Responsibility for Actions

The immediate responsibility for taking action rests with the ranking employee on the scene. Responsibility for further action will move to higher levels of supervision depending on the extent of the spill, the ability of local units to control it and the damage potential.

Any Employee - Any employee discovering a leak or a spill will take all steps possible to immediately stop the escape of oil or reduce the hazard and then notify his supervisor, the Pipeline Superintendent, or the OCC as soon as possible.

Station and Terminal Operators - When the station or terminal operator discovers a spill, he should take whatever action is available to him in closing valves, bypassing a leak area or shutting down the pumps in order to stop the leak. Any indication of a leak will be verified with the OCC and the responsibility for shutting in the system passed on to the OCC.

OCC Operator - The OCC operator when notified of a spill will shut down the pipeline and alert the OCC supervisor or the Pipeline Superintendent who will initiate and expand the response plan to a level of authority and degree of activity consistent with the spill situation.

OCC Supervisor and/or Pipeline Superintendent - The OCC Supervisor and the Pipeline Superintendent have key responsibilities in this contingency plan. The OCC supervisor is to make sure the pipeline system is shut in to minimize the volume leaked and the Pipeline Superintendent to

make sure containment and clean-up operations are initiated. These action responsibilities are in addition but coincident with their responsibilities to insure that the reporting and alerting procedures are fulfilled.

The Pipeline Manager will arrange for additional assistance not available to the Pipeline Superintendent such as additional company men, contract services and equipment from outside the Pipeline Superintendent's area of responsibility.

Initiation of subsequent action by the Plant Manager, General Manager and corporate management are indicated by Figure 6.

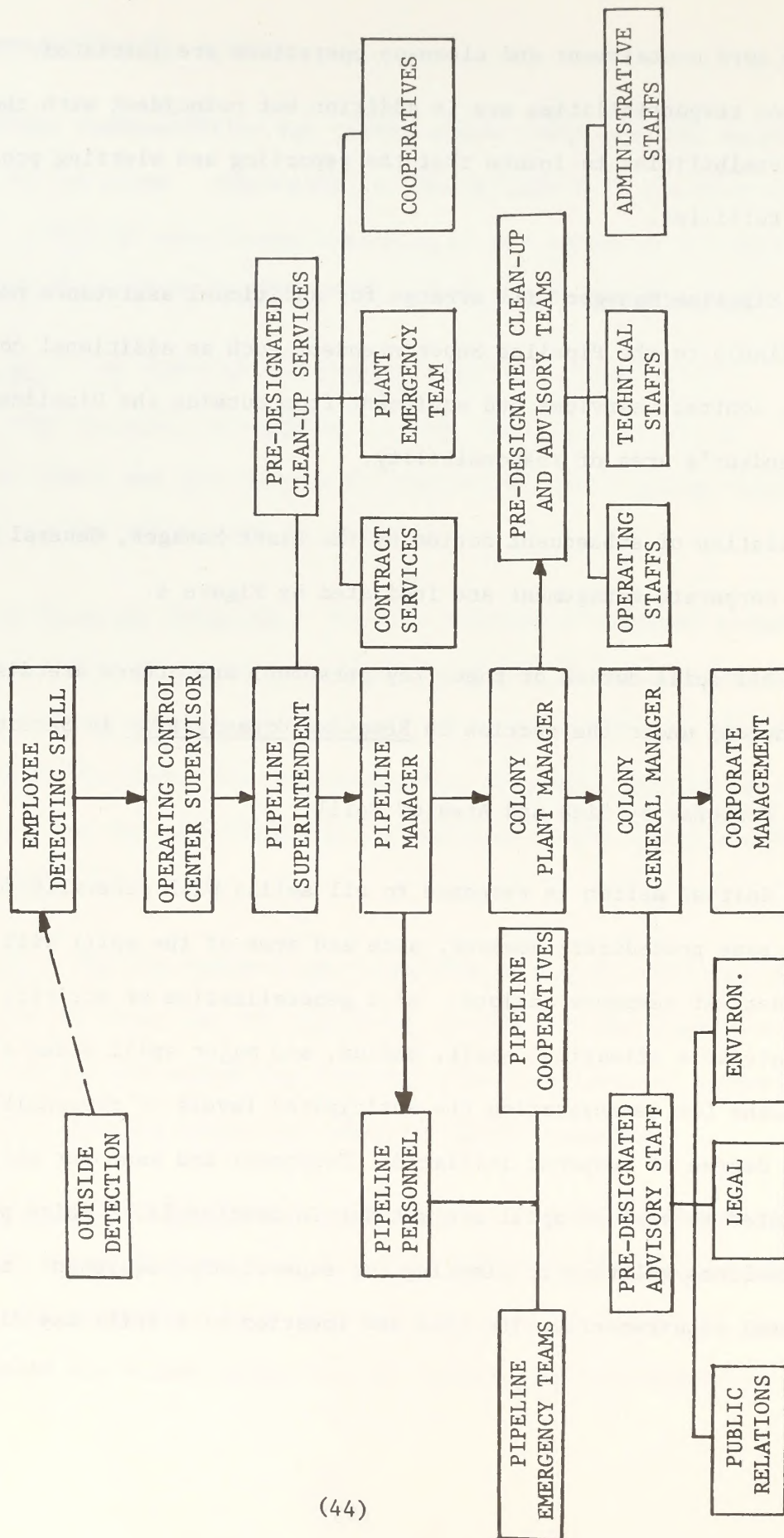
The oil spill duties of these key personnel and others are discussed in detail under the section on Response Organization in Section IX, D and E.

#### D. Response by Size and Area of Spill

The initial action in response to all spills will generally follow the same procedures; however, size and area of the spill will dictate subsequent response actions. As a generalization of activity appropriate to a situation, small, medium, and major spill sizes are used as a means for demonstrating the anticipated levels of responsibility and the degree of response initiated. Equipment and manpower guidelines related to size of spill are set out in Section IX, F which provides guidelines relative to planning for supervisory, equipment, and personnel requirements. The area and location of a spill may dictate

FIGURE 6

RESPONSE AND ACTION



followup responses even more than the size of a spill, as discussed below in relation to critical spills. Once the spill has been located, the maximum volume that could eventually leak out may be estimated using the line profile (Figure 15) and the drainage volume printout. (Table 4)

This initial estimate is only a planning and alerting factor and does not determine the ultimate amount of oil spilled.

Small Spills - Small spills are classified as those less than 25 bbls. Even on minor spills, APL's management is concerned about the degree of impact and efficiency of clean-up; however, this size spill usually requires the assistance of less than 10 men to clean up and if entirely on land is not likely to spread over a sufficient distance to require multiple crew supervision. A small spill would then normally fall within the capabilities of the Pipeline Superintendent's supervision and responsibility. The clean-up probably could be accomplished with assistance from one or more outside contractors or a team supplied from the plant operating complement assigned to plant oil spill response duties. Under small spill conditions, the superintendent could normally handle all aspects of the accidental spill occurrence: pipeline repair, arranging for personnel and equipment supply, containment and clean-up supervision, reporting and any followup in regards to furnishing information for public relations and liability purposes.

Medium Spills - Medium spills are classified as those between 25 and 250 bbls. This amount of oil may require cleanup of a relatively extensive area if the oil reaches flowing water, especially if the oil cannot be contained within a few hours. This situation usually would

require dispersed supervision and introduce problems of logistics and communication. Even on land, this size spill can require such supervision and introduce responsibilities beyond the authority of the Pipeline Superintendent. The expenditures and magnitude of response would be commensurate with the specific conditions dictating the effort required to minimize and mitigate damage to the public health and welfare. However, the cost of cleanup, manpower, and equipment requirements associated with the medium sized spill usually dictate that additional levels of authority respond to a spill incident.

It is anticipated that with a small operating pipeline complement and the relatively isolated routing of this pipeline, the moderate sized spill would require assistance from private contractors, cooperative associations and plant clean-up crews, especially if the oil entered any moving water and the area of cleanup was expanded. The responsibility for direction of response actions might then pass to the Pipeline Manager. The Pipeline Superintendent would then usually assume responsibility for pipeline repair and return of the system to service.

Major Spills - Major spills have been classified in regulations as those of a volume in excess of 250 bbls. into inland waters, generate critical public concern or pose a substantial threat to the public health or welfare. A spill greater than 250 barrels usually creates outside interest beyond the attention of the regulatory agencies involved and requires special input to the contingency plan from advisory staffs on management levels such as Public Relations, Legal,

Environmental, and Communications Personnel. The responsibility and direction for major spills will rest with the appropriate management level (Pipeline Manager, Plant Manager, General Manager or Vice President) dependent upon the situation. For instance, a maximum spill of 12,000 barrels at a location where part of the oil reached the Colorado River would probably activate all levels of the response organization and require the full capabilities of both the contractor and cooperative outside services in addition to programmed internal support.

Critical Spills - The design features employed to prevent and restrict the volume of a spill, the analysis of the terrain and ecology along the route have prompted a spill response plan geared to evaluation of the situation rather than just size of the spill. Design and route selection tend to reduce the size and impact of spills; however, certain areas are critical from an ecological, social, or economic standpoint. Some of the critical areas are identified in Appendix D. A critical spill might be less than 25 barrels; however, on a volume basis it probably would fall in the range between 250 and 12,000 barrels. Under the conditions that exist along the pipeline route, all degrees of action applicable in small to major spill situations might be employed. That is, a 500 barrel leak that was essentially self-contained and absorbed on land may very well be handled as would a small spill as to involvement of levels of authority, but 1500 barrels into a waterway would be responded to with manpower and equipment as a major spill. Or even a 25 or 250 barrel spill in what might be termed a critical area, while not requiring the equipment and manpower of the 2500 barrel spill, could involve

the full scope of the spill response organization input, as shown in Section IX, Figure 7.

In general, however, a 1000 barrel spill could be considered beyond the capability of the Pipeline Superintendent and Pipeline Manager.

In view of the critical nature of the situation and the possible requirement for more men and equipment than might be available to the Pipeline Manager in this area, the Plant Manager of higher authority would have to assume direction and management of the response activities.

#### IV. Containment and Countermeasures

Efforts to minimize the amount of oil lost from the pipeline and to control its spread can be the most significant reactions in implementing the Oil Spill Response Plan. Pipeline design features, automatic controls and monitoring procedures remote from the scene will limit the losses once a leak occurs. However, other than where pre-constructed diking systems were employed, the containment action requires bringing trained men and equipment to the scene as quickly as possible to analyze the situation and employ containment procedures.

Containment and countermeasure responses proceed simultaneously with the notification procedure as reflected in Figure 1 showing notification and alerting actions. The containment actions would be expanded with time and reaction to the situation, especially if a large amount of oil is involved. This increasing and broadening response is indicated in Figures 2 and 6. Those pre-planned actions, guided by the size and the area of spill occurrence, would follow the quick initial response and the response requirement investigation period.

The route chosen for this pipeline is such that containment and clean-up of any oil spilled would most likely be on land. However, the pipeline does cross the Colorado River and crosses or is close enough to some streams that both land and water containment procedures must be considered. While each potential spill location calls for individual con-

sideration of techniques to be employed, the general methods described are applicable to this overall system and route.

#### A. Source Control

Source control has been covered in most respects in discovery and notification procedures; however, in some instances and especially in the case of a major line break, on-scene source control is critical. This involves closing of manual valves and immediate repair or the employment of temporary repair techniques. Actions taken to control the source of the spill as well as to immediately contain the oil can develop a conflict of efforts and manpower availability since these two actions require simultaneous responses. However, in certain instances, it is the control of the volume that may prove to be more significant to the eventual cleanup and impact. In these situations a split delegation of responsibility may be dictated as indicated on the organizational chart for major spills shown as Figure 7. In such situations the Pipeline Superintendent would take charge of spill source control and the Oil Spill Control Coordinator would direct containment operations.

#### B. Control of the Spread of Oil

The conditions under which containment of oil from a leak or break along this pipeline route are so varied that a wide variety of methods and equipment must be considered in both pre-planning and actual containment actions. Dependent upon the size, location and time of year, the lag time for arrival of men with containment equipment on scene could vary from one to four hours after identification and location of the

spill. This lag time in conjunction with the above mentioned variables is a factor as to where and how the oil would be contained.

At any rate, containment of oil on land or water must be undertaken as soon as possible, for the sooner action is taken the more effective the overall clean-up operation is likely to be. When large volumes of oil are spilled, especially if there is a chance for oil to escape the immediate area, containment response at numerous and remote locations may be required. Containment in this case must be considered as a continuing and growing operation. This progressive action is demonstrated by the time frame vs. actions given in Table 2. Theoretical plans of action are further explained in Appendices D and E describing spill pre-planning by sections along the route.

When oil does escape the immediate area, control and diversion tactics directed at minimizing impact on the environment and protection of public health might be indicated as the factor controlling the kind of equipment employed and the techniques to be used. Surveillance and communications, discussed later in detail, are particularly critical to effective control of the spread of spilled oil.

#### 1. General Techniques

The control of oil spreading outside the area of natural containment may be attempted by construction of dams or diversion ditches; employing booms or barriers; use of absorbents; or, in situations critical to safety or potential fire hazards, the use of chemicals to disperse or coalesce the oil on water.

T A B L E 2

## CONTAINMENT AND COUNTERMEASURES

	OIL SPILL CONTROL		PROCUREMENT	DAMAGE CONTROL	
	DEPLOY EQUIPMENT ON HAND			ATTEMPT TO SHUT OFF SOURCE	
IMMEDIATELY					
FIRST 4 HOURS	DEPLOY LOCAL CONTRACTOR AND COOPERATIVE BOOMS AND ABSORBANTS		ORDER APPLICABLE CONTAINMENT EQUIPMENT FROM STOCKPILES AND SHELF MATERIALS  ORDER SPECIAL DAMAGE CONTROL MATERIALS	MAKESHIFT REPAIR WITH EQUIPMENT ON HAND	
NEXT 8 HOURS	CONSTRUCT AND REVAMP CONTAINMENT DEVICES TO SUPPLEMENT EMERGENCY EQUIPMENT IN PLACE  RE-DEPLOY ORIGINAL EQUIPMENT WHERE APPLICABLE		ORDER AND BRING IN ADDITIONAL STANDARD EQUIPMENT BOTH FROM OTHER COMPANY FACILITIES AND REMOTE MANUFACTURERS	BRING IN AND EMPLOY SPECIAL REPAIR UNITS AND CONTRACT SERVICE AND EQUIPMENT	
NEXT 12 HOURS	DEPLOY NEW EQUIPMENT FROM REMOTE SOURCES AND DEPLOY HOMEMADE EQUIPMENT		VERIFY DELIVERABILITY OF NEW AND EXPERIMENTAL DEVICES  REPAIR AND MAINTENANCE REQUISITIONS	INITIATE PERMANENT OPERATIONS IF PRACTICAL	
NEXT 24 HOURS	REDEPLOYMENT MEASURES AND REPAIR AND MAINTENANCE		DELIVER EXPERIMENTAL EQUIPMENT IF APPLICABLE	CONTINUE OPERATIONS IF APPLICABLE	
SUBSEQUENT 24 HOUR PERIODS	DEPLOY EXPERIMENTAL AND NEWLY CONSTRUCTED DEVICES APPLICABLE TO UNUSUAL CONDITIONS		SUPPORT CONTINUED NEEDS	RETURN FACILITIES TO OPERATION IF APPLICABLE	

a. Dikes and Diversion Ditches

Oil spilled on land and in certain instances into small streams may be contained by construction of earthen dams to form holding ponds or be diverted into natural containment basins by cutting ditches to direct its flow.

b. Booms and Barriers

Manufactured booms of the types mentioned in Section IX, F and in Appendix B can be used to divert oil and under certain conditions, when water is quiet or slow moving, to contain oil on the surface of the water. Barriers constructed from natural materials, both semi-permeable as from fir branches or straw or impermeable as when logs are used, can be deployed to restrict the spread of oil on water. Both types of containment devices have their limitations, but when used in connection with oil removal equipment they can be partially effective even under stream flow rates above one foot per second.

Booms are exposed to high mechanical loads especially by debris accumulation and under these conditions must be protected by open barriers of fencing, etc. Absorbents, which are discussed later, also may be used to supplement boom effectiveness if collection procedures can be employed to recover the material including entrained or trapped oil.

c. Absorbents

Absorbents may be effectively employed on small spills on land surfaces, for oil on quiet ponds, and in some cases for oil on moving

water such as described above when using booms. Under large or major spill conditions the use of absorbents will probably play a secondary role to the employment of dikes and booms.

In certain instances such as moderate spills on land, the use of absorbents, especially natural material such as straw, can provide a measure of containment lending itself to clean-up without introducing side effect environmental impacts. However, the use of absorbents to restrict the spread of oil creates a subsequent problem of disposal.

d. Dispersants

The use of dispersants is restricted by regulations and their utilization is not expected to play a significant role in the plan of action. Any use would be cleared with proper authorities. Requests for use of dispersants would be based upon circumstances involving individual and public safety and when other means could not be effectively employed.

2. Surface Conditions

The above containment actions can be further related to conditions that could be encountered such as spills on land, into ditches or ponds containing water, slow and fast moving water in streams and rivers, and on ice or snow.

a. Land Surface and Subsoil

The usual techniques to be employed on land and subsoil spills are:

- 1) Trap oil in ditches or gullies by construction of earthen dams or berms.
- 2) Build temporary ponds and dikes by hand or with earth moving equipment to pond oil.
- 3) Cut ditches to hold and divert oil to natural or constructed containment systems.
- 4) Spread absorbents or construct absorbent barriers such as straw bales to prevent spreading and leaching.
- 5) Cultivate soils to assist in natural surface containment.
- 6) Cut ditches or drive sand point devices to contain oil flow that has entered permeable soil, sand or rocky areas.

b. Ditches and Ponds Containing Water

- 1) Construct dams or berms at outflow points with a pipe or conduit syphon to allow water to escape while containing the oil. This may have to be repeated downstream for fast flowing water in shallow ditches.
- 2) Deploy booms to restrict oil from spreading or being blown by wind across the entire surface of a pond.
- 3) Gather the oil to a specific area or divert its movement by employment of booms.
- 4) Spread absorbents, natural or artificial, to restrict the spread of oil.
- 5) Consider the use of a coalescing agent to confine thin films of oil to a limited area.

c. Oil on Moving Water in Streams

- 1) When flow rates are greater than about .5 ft./sec. install a boom or barrier diagonally across the stream to hold and direct oil and allow water to flow underneath.
- 2) Employ absorbent booms, natural and artificial, to contain small amounts of oil or oil films. Replacement of absorbent medium or multiple placement is usually necessary.
- 3) Under low flow conditions or on minor waterways cut diversion ditches or employ booms to temporarily divert oil and water into an area of quieter water or impoundment.
- 4) In streams flowing faster than 1 ft./sec. attempt to direct oil to shore line by a series of booms and absorbent barriers placed at high angles to the shore line. Cut retaining ponds or ditches back into stream banks.
- 5) Broadcast absorbents and retain oil and absorbents on downstream booms or permeable barriers for subsequent removal.
- 6) Use booms and barriers to direct the oil in a fast moving current to quieter or eddy areas and into natural stream bank containment areas.

d. Snow and Ice

Spills under conditions involving containment in snow or ice covered areas are complicated in one sense that some of the methods discussed on land or water are not applicable. On the other hand, the snow and ice have natural containment characteristics and the associated low temperatures can reduce the rate and area of spread

of oil. This is particularly so with oils that exhibit a relatively low pour point such as the oil to be transported in this pipeline. Techniques considered applicable to containment under ice and snow conditions are:

- 1) Construct berms of ice and snow as in land spills to confine the spread of oil.
- 2) Use snow itself to act as an absorbent to confine the spread area.
- 3) Use absorbents and especially straw to contain the spread of oil on top of ice.
- 4) Use ice and snow as barriers to contain spread of oil on ice.
- 5) On smooth ice, use absorbent barriers such as straw bales to confine spread.
- 6) Oil under ice over quiet water may best be restricted to a small area by removal of water and oil from a hole cut in the ice.
- 7) Oil on flowing water under smooth ice may be diverted to shore and contained by cutting channels in which barriers or booms could be placed as in flowing water conditions.

#### C. Countermeasures vs. Containment

There are certain situations where a countermeasure type of response may be required as distinguished from actions to contain the oil and prevent spreading. These are associated with protection of public health and minimizing environmental damage in one area vs. another.

Some of these situations arise where wildlife or marine life can be protected by diverting oil from their habitat or when potable water intakes

are in the line of spreading. These potential conditions were recognized (2) and are considered in response plans covering the areas set out in Appendix D.

Such countermeasure approaches require prior and on-the-spot evaluation and decision making as influenced by economic, social and environmental risks.

In some cases, cooperative action or assistance by other parties must be depended upon in order for APL to conduct effective response activities to cleanup spilled oil and minimize potential impacts. These situations usually arise in conjunction with response activities and normal water and land traffic pattern interaction, water use, both public and industrial, and public, private or government recreational areas and means of access. Outside assistance would be requested to control the oil spread when the situation dictated: for example the closing of irrigation dikes, shut-down of water release from reservoirs, shifting to auxiliary water use systems or restriction of water uses and shoreline and road traffic control. Such actions usually require civic or regulatory assistance and applicable emergency alternatives will need to be considered.

#### D. Repair Measures

When repairs are being planned or are in progress during early response to the spill, repair personnel must consider measures for containment of the oil being released. When it is necessary to release oil from the system to make repairs temporary ponds may be constructed or mobile containers employed to hold any oil released. If repairs are under a

different supervisor than those personnel responsible for containment and cleanup, their operations will be coordinated by the responsible manager over both operations.



## V. Clean-up and Removal

Clean-up and removal of oil, absorbents and associated debris would be initiated immediately following the deployment of containment equipment on hand. In fact, containment may not be effective unless this activity is supplemented by clean-up and removal operations. Early removal of oil is also important since the clean-up time may have to span a period of several days and the changing weather conditions or containment equipment failures may expand a controlled spill unless the free oil can be removed.

Clean-up and removal of oil from the water is not only ecologically desirable (2)(12) but usually required (10) and is the main goal of the oil spill response action. Clean-up and removal from structures, shorelines or land areas subject to percolation into ground waters would be incorporated into the plans for continuing response actions. Natural clean-up resulting from dispersion by weather and time for subsequent biodegradation will occur over an extended period for clean-up. In some cases, the clean-up of spill residue and removal of vegetation, soils or even shoreline disturbance may cause more damage than either natural dissipation or some form of treatment in place. Such decisions would be made in conjunction with proper authorities.

The recovery of free oil or oil saturated debris triggers disposal operations that require a plan for controls to prevent environmental impacts. In the cases where less environmental damage may occur if oil is left in

place to allow concentration or biodegradation, adequate protective measures would be taken to insure against further short or long term releases from the localized area and prevent a fire hazard. Spontaneous combustion is always a consideration in collection and disposal of oil saturated debris or absorbents.

The specific clean-up methods and type of equipment employed will depend upon the particular situation encountered; however, certain general approaches are applicable to conditions along the pipeline route. The basic actions and techniques employed during the clean-up phase are:

#### A. Collection and Recovery

It follows that the more effective the concentrated containment of oil, the more chance there is to recover substantial quantities of the amount spilled. It is almost impossible, however, to recover oil from water and soils without becoming involved in the problems associated with handling excess water and debris.

Debris, in connection with removal on water, can hinder and reduce collection device effectiveness, and skimmers and pumps must be protected against clogging. Removal of oil coated debris or special absorbents usually has to be accomplished by mechanical means in conjunction with liquid removal operations. Although collection and skimming devices for removing oil off water under field conditions are somewhat inefficient and difficult to work with, they provide the clean-up crews with a portable and quickly deployable system. These devices, such as floating pump intakes, are most successful under quiet water conditions and where

oil can be collected to a thickness of more than 1/4 inch.

Withdrawal of excess amounts of water with the recovery of oil usually requires auxiliary settling systems, either tankage or quiet ponds, from which the oil can be collected and removed. Because of the varied conditions encountered, it is anticipated that collection and removal operations will bring into play improvised collection devices in addition to use of off-the-shelf oil spill removal equipment. Supply of such equipment as pumps, tanks, vacuum trucks and excavation equipment can be obtained from the sources of supply and service already in the area of potential incident (Appendix B).

Under ideal conditions oil may be trapped in an area essentially free of vegetation, water and debris. The oil can be pumped off into vacuum trucks and returned to storage or treatment facilities. Oil recovery may impose difficult problems in regards to reclaiming of contaminated oil and the necessary procedures are anticipated in pre-response plans.

Under winter conditions, recovery of oil can either be simplified or aggravated depending on size of spill, type of terrain and a number of other variables. Inaccessible areas may require that oil recovery be deferred and in that case, precautionary entrapment measures would be employed to facilitate later recovery and prevent escape of oil due to a melt and runoff.

Prior to putting the line into operation, arrangements would be made for preplanned stocking of equipment for assistance or supplies from contractors or cooperatives to this Plan.

## B. Removal of Soils and Vegetation

Clean-up operations may require that oil saturated soils or growing vegetation be removed from a particular site to avoid further contamination of the soil and plants or hazards to wildlife or humans, to restore the site to its original condition or to cleanup the area for the sake of aesthetic appearance. Prior to these clean-up actions, the relative impact of such procedures would be evaluated and discussed with appropriate authorities and private interests, particularly in those areas where multiple land use must be considered.

Removal of oil, soil, sand or vegetation requires disposal of the material removed and as such can lead to a transfer of a pollution problem from one area to another. In addition, removal may require restoration followup which in itself may prove to be less desirable than a temporary loss of scenic appearance. Nevertheless, there is a valid environmental justification for removal of oil saturated soils and vegetation if disposal in another location is more conducive to controlled containment or natural biodegradation and the original area can be restored. The minimization of environmental and ecological consequences may have to be balanced against regulatory or civil requirements. Any particular spill should be evaluated as to the specific conditions such as type of vegetation or soils, degree of contamination, time of year, etc. The relatively wide scope of the effect of oil contamination may be evaluated by a literature survey of publications listed in the EPA publication Biological Effects of Oil Pollution (13).

Such removal would be accomplished by mechanical equipment or by physical manpower. The equipment used is quite dependent upon the terrain, time of year and size of the spill. Graders or scrapers may be employed in one case whereas men with shovels, axes and rakes could only be used in another situation.

### C. Cleanup and Removal Methods

The particular area, time of the year, size of spill and effectiveness of containment, are all determining factors in selecting the techniques that should be employed and the type of equipment to be utilized for removal of spilled oil. Some of the examples in Appendix E demonstrate methods that are applicable to the various conditions catalogued in conjunction with the Environmental Setting Analysis (2) of the route prior to final route determination. Specific geographical areas along the route are analyzed in Appendix D; however, the following examples are representative of the overall conditions to be encountered.

#### 1. Recovery from Contained Water Sources

There is some potential for oil to reach or have to be contained on quiet water sources such as natural spring accumulations or stock ponds, swampy areas adjacent to rivers or continuous streams having natural water impoundments. Under these conditions, oil can be collected and concentrated in a localized area and removed from the surface using special oil spill pick-up equipment, improvised skimmer heads and portable pumps or, if accessible to vehicles, by vacuum trucks.

The oil may be pumped off into barrels, portable tanks, or constructed pits, lined or unlined, depending upon soil conditions. Under quiet water conditions, the adverse effect of debris is usually minimal.

Certain precautionary procedures are to be employed under the contained or quiet water conditions, such as fencing off the contaminated area to prevent exposure to livestock and wildlife; and use of noise machines if the possibility exists for water fowl exposure. If possible, the oil on the surface will be limited to a portion of the ponds or in shallow spawning areas quickly removed or diverted to another area so as not to cut off the supply of oxygen to fish and water life. This later action may be accomplished by sweeping the surface with booms; broadcasting of non-sinking absorbents such as polyurethane and quick recovery of absorbents; sweeping with sheet absorbent; use of surface confining non-sinking or toxic chemicals that do not disperse the oil but tend to corral it; and by use of water sprays, fans or aerator pumps. Under certain conditions, with the approval of proper authorities, burning of oil from contained water sources would be employed as a clean-up method.

Shorelines of ponds etc. would possibly be cleaned up by mechanical means including raking, removal of soils or vegetation as dictated by least environmental impacts or by washing and recovery from the water surfaces.

## 2. Running Streams

The collection and removal of oil from running streams is very much dependent upon the effectiveness of full or partial containment. Where a stream can be dammed, creating a quiet area where water can be drained

off below, skimming equipment may be employed with fair success. Even if a thick layer of oil on water cannot be built up, the broadcasting and recovery of absorbents containing oil can be used as a workable technique.

When the oil is essentially along one side of the stream or if booms can be used to divert it to one side of the stream, a quiet area or a diversion side stream can be formed to allow concentration of oil moving on slower water. Under these conditions, higher volume pumps can be employed to pump oil and water into a tank or pit where the oil can be further concentrated and removed and clean water returned to the original source.

Techniques of removal are usually less effective in fast water streams; but because of the rapid natural cleansing action and short exposure time, fish kill and recovery problems are anticipated to be less critical than in quiet water. However, natural shallow water eddy current collection points, breeding areas and feeder ponds will require on-the-spot assessment and possibly prompt recovery action, or in some cases where fast, effective recovery is impossible, diversion of an oil concentration into the mainstream for recovery at a more advantageous recovery location or where fish are not likely to be present.

Shorelines of running streams tend to be self cleaning. However, under certain conditions of heavy oil concentration, they can be cleaned by physical shoreline disturbance, jet spray washing or left to natural cleaning action. Vegetation and debris are found along some of these

streams that could be in the path of leaked oil. From an overall ecological viewpoint, self cleaning and biodegradation may be an alternative to removal depending upon exposure vs. restoration impact.

### 3. Fast Moving Rivers

The pipeline route corridor analysis recognized the potential of spills into the Colorado River and the difficulty of recovery of oil under the conditions of a high rate of flow and the icing conditions in winter.

Pre-planned contingency actions and distance from the Colorado are designed to minimize the potential of an oil spill getting into the Colorado; however, the pipeline does cross the river at Moab, Utah. Techniques to be employed at that location are covered in Appendix E. Clean-up actions on the Colorado or White rivers as to general methods are covered here.

The relatively high rate of flow of the rivers, some five to ten miles per hour at various times and locations, makes containment and clean-up effectiveness most difficult. It is not likely that under the most adverse conditions possible, full containment could ever be accomplished so the actions planned are directed toward concentration and removal of as much oil as quickly as possible. In this situation, surveillance and lead time for employment of equipment and manpower are very critical to the response effectiveness. It is less likely that oil would enter the White River or the Colorado from points above Grand Junction where plans are directed to containment and recovery in tributary streams as discussed in Appendix D. However, in recognition of all possibilities

potential diversion and collection points are shown on Figure 14. Because of the width of the rivers, operations would have to be conducted from one bank or another. Multiple boom placement, not for the purposes of containment but for diversion and control of spreading, would be employed to direct oil into natural eddy areas and side channels where recovery equipment could be moved in to pump off any retained oil. Accessibility for heavy duty pumping and trucking equipment is essential to such actions.

Since the Colorado flows at a rate above that at which oil can be contained without some escape by underflow of booms, it is anticipated that relatively continuous removal methods will need to be employed and oil and water pumped to temporary storage for concentration and final recovery. High volumes of water would normally be entrained with the recovered oil and pits or portable tankage might be used to concentrate recovered oil.

The rocky shorelines of the Colorado River would probably be naturally cleaned; however, offshore and onshore inspection and shoreline clean-up actions will be evaluated in conjunction with surveillance activities conducted to keep up with the movement and dispersment of oil under the high water flow rates to be encountered. The oil may be expected to spread over the water surface and be dispersed by currents, wind and turbulent surface conditions. This effect will probably be observed to a lesser degree in water temperatures below 50° F.

It is planned that boats will be employed in the recovery operations. Third party equipment in the area of anticipated response is listed in

the Logistic Supply Section.

#### 4. Dry Stream Beds

It is more likely that any oil that leaked from this pipeline would enter a dry stream bed rather than one containing water. The route selected does not follow continuous streams over much of its length, and in many areas the natural drainage systems close to the pipeline right-of-way are normally dry. These drainage systems are natural collecting areas and when in a dry condition tend to contain the oil and restrict its spread. They do, however, sometimes create a recovery problem since their bed material tends to be unconsolidated and porous and this condition can make cleanup difficult. Where oil has accumulated in pools or been contained by dams, the free oil would be pumped off into barrels in inaccessible areas or, where possible, directly into tank trucks. While no maintenance road is to be maintained, the arid areas along the route are generally less difficult to traverse by vehicle.

Where oil has penetrated and saturated the stream bed material, the clean-up action may require removal and disposal at a location less susceptible to future contact with ground or runoff waters. It is possible that sandpoints could be set under some dry stream bed conditions and heavy concentrations of oil collected and pumped off.

Clean-up of the rocks in an arid area would probably only be done where aesthetics were significant. If the oil was removed by washing or scrubbing, it would only re-enter the ecological system in possibly a less desirable form with further impact potential. The period of final

dry stream bed clean-up may have to be deferred to a period when the stream contained water and any residual oil could be trapped and removed. Depending on the residual oil concentration, the area would be monitored or isolated as to insure against future release of oil.

#### 5. Sparsely Vegetated Arid Land Surfaces

Spills on land are generally self contained on the surface or to a shallow depth except within the pipeline trench or in rocky areas with fracture or void systems. Clean-up on land surfaces may lend itself to dispersion and biodegradation in place or require removal and disposal of soils. This action is discussed more generally in Section V-B.

Where small areas of free oil are present, bar or shallow drainage ditches may be used to facilitate collection and recovery of oil by pumping it off. When concentrations are shallow or scattered, absorbents such as straw may be used to take up the oil and subsequently be picked up or cultivated into the soil.

#### 6. Land Surfaces Covered with Vegetation

Oil spills into areas with trees or heavy vegetation can offer a difficult problem for cleanup of the area, as well as cause additional environmental impact by the methods that may have to be employed. The oil can be removed by removing vegetation and trees. Prior to taking such action, the biological effects of oil pollution vs. direct impact by cleanup can be investigated for the specific situation and a cleanup and restoration problem established. If the runoff from such an area can be contained, any concentrated oil collected and removed and the area isolated from

contact with wildlife, the best course of action may be to defer cleanup if such action called for stripping the surface and cutting down trees. If soil pollution cannot be controlled or if the vegetation is permanently destroyed, then the trees and vegetation could be removed and the area mechanically cleaned up rather than depending upon the process of biodegradation of the spilled oil. The significance of these actions and subsequent restoration and revegetation are covered as separate phases of the clean-up period.

Under the conditions observed along the route where heavy ground vegetation and trees would be exposed to oil spills, the best course of action appears to be downslope containment and deferred cleanup with adequate measures for isolating the area from stock and wildlife.

#### 7. Surfaces Covered with Snow or Ice

The clean-up of oil spills along this pipeline route in areas where snow or ice would cover land or water surfaces or partially cover flowing streams and rivers, brings into play a major accessibility as well as difficult techniques for cleanup and removal. Clean-up methods and technology have been directed more toward dry land and water clean-up activities; however, this Contingency Plan also anticipates response under conditions involving snow and ice cover.

In an accessible area, snow containing oil as well as shore ice entraining any oil can be removed and deposited in a safe disposal area. When the ice and snow cannot be removed, burning of oil accumulations or oil recovery using some straw as a collector can be employed and then burning

of the mixture used as the disposal method.

When the oil cannot be recovered, protective and isolating measures must be taken to recover the oil at a later date during melt periods. Fortunately, oil exposed to ice and snow cover is usually localized in areal extent.



## VI. Surface Clean-up and Restoration

Even after oil collection and recovery of substantial amounts of oil, oil soaked debris or vegetation; land surfaces, shorelines, structures and trees may retain residues of oil; or after having removed soils and vegetation, the area will have been altered. Unsightliness must be balanced against any potential ecological damage due to the clean-up actions employed and any subsequent impacts, such as those resulting from erosion.

During the hectic early period of spill response, there can be a tendency to direct the action so as to alleviate the most obvious and immediate impact potentials. However, the initial containment and clean-up phases are in a sense a restoration action. Since these initial activities can complicate subsequent programs, the possibilities for restoration would be considered during the containment and clean-up phases. Any actions taken should be complementary to and support minimal environmental impact over the total response period.

While it is impractical to evaluate the best approach to surface cleanup or the restoration potential along every mile of a pipeline route, it is planned to make on-the-spot assessments of soil conditions, successful revegetation probabilities and requirements for restoration recontouring at the time a spill occurs. This procedure will help to insure against additional impact due to the after effect of spills or to the clean-up operation itself.

Usually a complete documentation of the ecological and physical pre-spill conditions is not available. This plan is supported by a relatively detailed background analysis of the route environment (2) and this advance information has been utilized in developing the applicable response techniques.

However, during the early stages of response to an actual spill situation, field assessment is still necessary to define the specific pre-spill conditions and to provide input and guidance for the containment and cleanup activities so they will support the long range restoration operations.

Various alternatives will be evaluated in considering the specific restoration actions to be employed and biological impact vs. appearance; oil into soil cultivation rather than soil removal at extensive land spill sites; animal and bird cleaning vs. restocking, etc., sometimes warrant deferred restoration consideration.

## VII. Disposal of Recovered Oil and Recovery of Associated Materials

As has been previously discussed, the objective and responsibility of APL is to remove as much of any oil spilled as would be feasible (consistent with regulatory requirements or legal obligations) and to do so in a manner that will minimize environmental impacts. When oil is recovered, it is usually mixed with impurities that require removal or if this is economically and technically unfeasible, the recovered oil and associated soils, vegetation or general debris must be disposed of.

Under more ideal conditions where mechanical separation of solids is possible, contaminated oil will be returned to the oil shale plant area for reprocessing or delivered to waste oil reprocessors in the area. When the ratio of solids to oil is high, oil and contaminants will be disposed of in approved underground disposal areas. Such a potential area is at the processed shale disposal site within the plant complex area.



#### VIII. Post Clean-up

Followup involving reporting or settlements subsequent to completion of the response action or during a period of deferred restoration, requires that the actions taken during the spill clean-up anticipate such requirements and that adequate documentation procedures be initiated. Documentation and claims evaluation are considered an ongoing part of the Contingency Plan and will reflect APL's assumption of proper responsibilities as set out in the Policies and Practices section.

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## IX. The Response Organization and Material Requirements

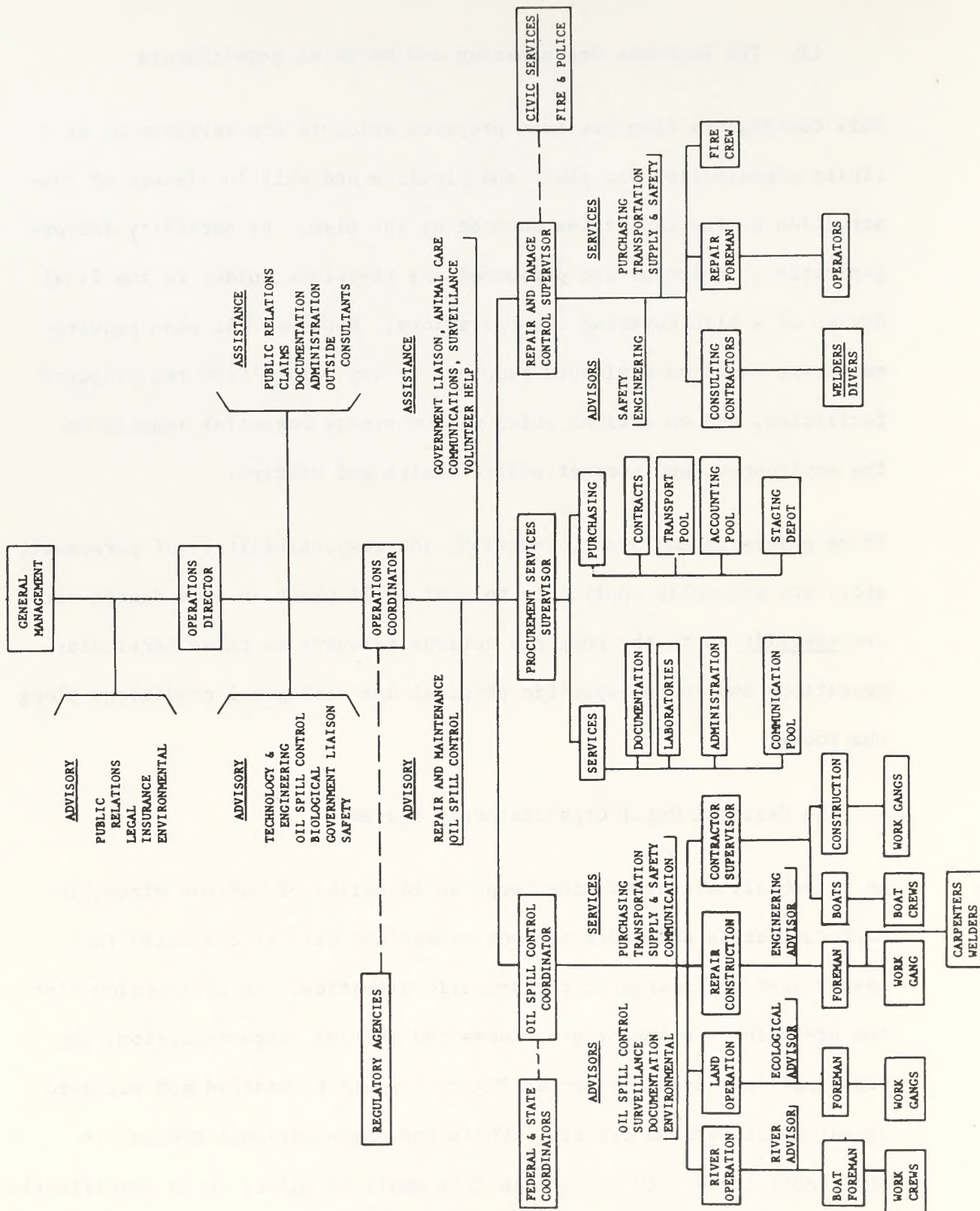
This Contingency Plan has been prepared prior to the development of a finite organization for plant and pipeline and well in advance of construction of the facilities covered by the plan. By necessity the organization, equipment and personnel are therefore guides to the final design of a plan covering the operations. However, the plan requirements are based on a planned response to any spills from the proposed facilities, and on actions which will minimize potential impacts on the environment and protect public health and welfare.

These guides to equipment, functions and responsibilities of personnel, etc., are generally applicable to most spill plans in some degree but are specific as to the response actions relevant to these particular operations and to the specific physical and ecological conditions along the route.

### A. The Critical Spill Organizational System

As previously discussed, the response to spills of various sizes, in different areas and under various conditions will be conducted in a manner most applicable to the specific situation. In conjunction with the prescribed reporting procedures and initial response action, the organizational system shown as Figure 7 would be staffed and put into operation to various degrees. While the organizational concept is applicable in part to all spills from small to major, it is specifically designed to provide contingency planning for the most critical spill

### Figure 7



situation which might be predicted. For the small spill then, the Pipeline Superintendent would fill most of the supervisory positions and perform the required functions until his capabilities and authority were exceeded by the response required to do an effective job. The internal reporting, response and action procedures shown in Figures 1 and 6 will automatically activate the organizational system to the required level and scope of personnel involvement.

#### B. Potential Functions Involved in Response Activities

A major spill in a critical area often sets off a complex chain of events that are non-routine in nature. Within the time frame allowed for response, activities can best be handled by assignment of responsibilities or tasks based upon an analysis of the functions that have to be fulfilled.

As shown on the response organization chart, various management, supervision, physical work, advisory, and service duties have to be performed. Such assignment and delegation of responsibilities are to be made in the contingency planning and training sessions prior to spill occurrences. However, actual spills tend to create emergency conditions and may require adjustments in pre-planning arrangements.

The following checklist of functions that normally need to be performed on a major critical spill provides a means of insuring coverage of tasks:

1. Communication within Organization
2. External Reporting
3. Mobilization of Equipment and People

4. Repairs and Damage Control
5. Transportation of Equipment and Personnel
6. Containment, Clean-up and Disposal Execution
7. Contacts and Relations Outside the Company
8. Organization and Management of the Operations
9. Assessment of Ecological Disturbance
10. Surveillance of Oil Spread
11. Gathering of Data
12. Documentation and Reporting
13. Negotiation and Servicing of Contracts
14. Equipment Evaluation and Design
15. Purchasing and Accounting
16. Supervision of Labor
17. Manual Labor
18. Maintenance and Repair
19. Record Keeping
20. Personnel Needs - Food, Pay, Insurance, etc.
21. Civil Services - Water Supply - Animal Care
22. Coordination of Volunteer and Outside Help
23. Safety and Security
24. Liabilities and Claims
25. Field offices and Housing Quarters

The above functions are so numerous and diversified that the need for adequate and qualified staffing of the response organization is to be anticipated.

Even in most major spill situations, the full complement probably would not be activated although most of the functions might have to be satisfied. The particular timing and magnitude of a spill may allow key people to handle a number of jobs and perform multiple functions. As the plan is unfolding, on-scene personnel could be required to fill a number of positions and perform many functions. A personnel checklist for staffing and brief descriptions of responsibilities are also included in this section of the Contingency Plan as a tool for response by initial on-scene personnel who would or must assume these functions until additional pre-assigned personnel are required and become available.

#### C. Personnel Support to Contingency Plan

The number of personnel and variety of skills necessary to staff the major critical spill organization probably exceeds the planned staffing to operate the oil shale pipeline locally. Assistance can be supplied from plant personnel assigned to oil spill response, parent corporation staffs and third party contract services. Ideally, third party services can make up a significant share of the working complement engaged in containment and clean-up operations; however, at the present time outside contract services along the route are not oriented to supply the equipment and services of a complete standby clean-up service. This is understandable in view of a low demand and economic incentive for such services due to the widely dispersed and intermittent occurrence of spills in this particular area. Early development of the response plan does, however, provide sufficient lead time for preparation and planning to supply the required personnel from in-house personnel pools, out-of-area

services, or by local third party incentive contract arrangements.

Reference to the spill clean-up organization diagram indicates the various types of activities that might have to be conducted, and the functional checklist sets out the various functions the personnel responding to the spill requirements may need to perform.

Most spills that occur from pipelines and that would be likely to occur from this pipeline do not require an organization as depicted nor necessitate the indicated complement of personnel and assistance. However, as part of this Contingency Plan, the unusual situation or major critical spill requirements will be acknowledged and planned for by prior assignment.

When the complement of an emergency organization is likely to be made up of intra-departmental, contractor, and possibly even other company or civil service assistance, the staffing to satisfy a particular response, as to duties and degree of activity, is facilitated by the following checklist of personnel requirements:

Managers

- General Management
- Operations Director
- Operating Coordinator

Supervising Managers

- Procurement and Services Coordinator
- Oil Spill Control Coordinator
- Facility Damage Control Coordinator

Supervisors

- Onshore Clean-up
- Offshore Clean-up
- Staging and Repair and Maintenance
- Salvage and Construction

#### Foremen

- Onshore Crews
- Offshore Crews and Boats
- Repair, Construction and Maintenance Crews

#### Coordinators

- Transportation
- Supplies
- Communications
- Documentation
- Contract Services

#### Services

- Samples and Testing
- Accounting and Payroll
- Communications
- Claims
- Purchasing

#### Assistants

- Public Relations
- Legal
- Insurance
- Government Liaison
- Volunteer Help and Bird Care
- Technical Evaluator

#### Advisors

- Oil Control Specialist
- Oceanographic and Weather
- Ecological and Biological
- Marine Advisor

#### Support

- Contractors
- Bird Care
- Safety
- Engineering
- Government Facilities
- Consultants

#### Labor

- In House
- Contract
- Volunteer

#### D. Organizational Responsibilities

The response to a spill is designed to be a planned, but it is nevertheless an emergency type, action. Such actions are not of a routine nature

and normal supervisory duties and authorities for expenditure may be exceeded due to the need for immediate response. Prior understanding of organizational responsibilities at various levels and delegation of functional authorities will avoid development of a bottleneck in carrying out the necessary containment and clean-up operations.

The use of third party contract services introduces a special situation regarding responsibility for actions in the conduct of assigned work. Third party services may make up a substantial part of the response team for a large spill. While they usually would be assigned to, or take direction from, a company supervisor, they are, as contractors, relieved of the responsibility for damage claim except in instances of willful neglect.

The following breakdown by locations and levels in the major critical spill organization provides a guideline for assumption of responsibilities:

General Management (Policy - Detached Headquarters)

Executive Manager - Overall guidance, Corporate-wide support

Advisors

Public Relations - Policy and coordination

Legal - Policy and coordination

Environmental - Policy and coordination

Insurance - Policy and coordination

On-Scene Command (Planning - Local Headquarters)

Operations Director - Management of response team

Operating Coordinator - Direction of overall response action

Procurement and Services - Direct Logistic support

Staff Advisors and Assistants

Public Relations - Organization and development of the Public Relations program

Claims and Insurance - Establishment of claims and procedures

Outside Liaison - Establishment of cooperative efforts and the coordination of relations with government agencies and civic groups

Technology and Engineering - Equipment evaluation and new concepts analysis center

Biological and Ecological - Assessment of environmental consequences and development of protective action and evaluation programs

Surveillance and Documentation - Establishment of observation and data collection procedures for planning and documentation

Animal Care - Arrangement for administration of bird or animal care requirements

Volunteer Help - Development of the arrangements to satisfy, or organize help from, volunteers

Administration - Provide the administrative services for operating levels

Oil Spill Control - Overall planning of followup procedures to most effectively support initial response actions

Safety - Organize the safety program applicable to the conditions

Repair and Maintenance - Analysis of repair and damage control procedures

Consulting Firms - Gather data and prepare reports to provide expert opinions

Operation Supervision - (Implementation - Central Operating Area)

Oil Spill Control Coordinator - Direct oil spill clean-up activities

Repair and Damage Control - Direct operations correcting, repairing, or salvaging spill source

### Staff Advisors and Services

Oil Spill Control - Provide guidance for application of techniques

Surveillance - Monitor extent of spill, clean-up execution, and data gathering

Purchasing - Fulfill equipment needs

Transportation - Supply planes, helicopters, trucks, boats, etc.

Supply - Contract services, people, food, housing, etc.

Communication - Provide communication modes

Safety and Security - Arrange security and monitor operation conditions. Coordinate with local civic services

Environmental - Provide special knowledge for supervisory guidance

Documentation - Provide documentation requirement guidance

### Clean-up and Control (Execution - Field sites)

Land Operations - Direct land containment and clean-up including disposal. Coordinate contractors

River Operations - Direct offshore containment, dispersal or removal to onshore sites. Coordinate contract services.

Repair, Construction and Maintenance - Arrange for and supervise new equipment assembly and for construction or repair of oil spill control equipment

Foreman, Crew Leaders, Superintendents - Direct five to ten man crews in clean-up, damage control and construction work

Consulting Contractors - Provide expert welding, diving, etc.

### Service and Assistance

River Advisors and Consultants - Provide on-the-spot backup for work direction

Contractors - Supervision and labor

Attention is drawn to the probability and requirement for responsibilities and functions to be activated at different levels and the functions and operations performed at different locations. A dispersed activity approach is usually needed in the case of a major spill. This introduces a communications requirement to insure coordination of the activities and coverage of the responsibilities and authorities so that the organization will function as a single unit in spite of the separation of activities and the emergency nature of the actions. This communication link will be discussed later in Section X.

#### E. Job Descriptions of Key Personnel

The infrequency of the oil spill response for many members of the organization requires familiarization with the somewhat non-routine assignments. This would be accomplished in pre-spill contingency planning sessions. While the major spill is not a routine occurrence, advance preparation allows and assures personnel assigned to the functional positions to adequately perform their respective jobs.

Assignment of responsibilities to key positions in the response organization is made part of the Contingency Plan to expedite an emergency response action and to further backup guidance for all levels of supervision, especially in the event alternate personnel need to be pressed into service. In the early phases of response and in the case of lesser response requirements, many of these positions may be handled by one man. For instance, duties of the Operations Director, Operations

Coordinator and Oil Spill Control Coordinator may be handled by the Pipeline Manager or by the Oil Spill Control Coordinator himself, while procurement, services and repair functions might be handled by the Pipeline Superintendent. This is reasonable and practical when the requirements are within the work load capabilities of the individual, but it does not eliminate the necessity of carrying out the duties of the individual jobs described.

The following job descriptions, although brief and general in nature, provide a basic concept for interpretation of the functioning of this Contingency Plan by company personnel directly involved in the plan. They also provide some insight for personnel coming on-scene to staff the organization in an emergency situation and for those agencies and interested civil services who might respond to some future spill.

General Manager - The General Manager fulfills an executive or senior manager job function in the response action. His headquarters are usually removed from the facility or Operational Control Center locations probably at a general office location or are at the appropriate departmental headquarters. This is a policy making and management position covering matters such as:

- a. Establish emergency authority and expenditure policies
- b. Utilization of corporate-wide support
- c. Magnitude of press coverage
- d. Response under distinctly moral or good Samaritan situations
- e. Intervention of governmental bodies in instances beyond company and industry control

- f. Sacrifice of major physical installations in lieu of possible ecological damage

Operations Director (On-Scene Commander) - The Operations Director may be referred to as the commander of on-scene operations. His role, however, is that of a decision maker and planner rather than that of a supervisor. While execution is the most critical phase of a successful operation, the direction and coordination which the Operations Manager's staff provides makes his job the key position to overall response performance. His headquarters, at the plant site, are within a reasonable distance of the scene. However, it is anticipated that on-scene contact and observation may be required on his part. He depends on the availability of his advisors and assistants, and this will be a significant factor in his location. His duties are usually involved with the following actions:

- a. Activation and organization of the major spill response team
- b. Assessment of the situation
- c. Establishment of communication up and down through the organization
- d. Providing liaison with regulatory agencies and press
- e. Developing the overall plan so as to cover all phases of response requirements
- f. Taking over, coordinating and directing the individual activities set in motion by initial response procedures
- g. Initiating cost accounting and documentation procedures at an early date
- h. Keeping abreast of the situation, changing plans as indicated

and escalating them promptly if necessary

- i. Providing stability and order to the operation
- j. Phasing out the response action and organizing long-term followup requirements

Operations Coordinator - The Operations Coordinator is an extension of the directing arm of the Operations Director in that he carries out many of the functions of the Operations Director once plans have been formulated and decisions made. In addition, he is the key link in the coordination between the various execution teams employed. He also provides a continuous feedback to the Operations Director and his planning team on how well the operations are conforming to the overall plan and what needs exist for spontaneous changes in approach and methods. More specifically, he performs as follows:

- a. Acts for and as the Operations Manager in the field
- b. Maintains on-scene liaison and provides in-the-field interpretation and direction of policies and prescribed plans of action
- c. Insures that necessary cooperation and coordination between various units, company, contractors, government agencies are taking place
- d. Gathers or pursues the information necessary for the Operations Manager to make planning decisions or to change the course of actions when critical situations arise requiring an immediate decision
- e. Supplies or makes sure on-scene advice and assistance are available to the field operational supervisors

Oil Spill Control Coordinator - The containment, cleanup and restoration phases of the clean-up operations may involve employment and supervision of a relatively large number of people, varied utilization of equipment under a wide variety of conditions and possibly over a large geographical area. The implementation of this response plan and effective execution of field operations falls under the direction of the Oil Spill Control Coordinator. This function may require the organization, supervision and coordination of complex operations both on land and on major rivers at isolated locations or over extensive areas. Because of the need for the design, fabrication and maintenance of equipment, and for the utilization of engineering and construction support units, many of the support functions developed at the headquarters offices would be decentralized to provide advice and assistance at his field Operational Control Center.

The Oil Spill Control Coordinator would come from the complement of the local facilities assigned responsibilities for response on this pipeline since it is important that he be familiar with conditions in the area. His work and supervisory forces come from on-site operating units, intra-departmental staffs and both local and possibly remote contractors since the local complements probably would not be able to provide the manpower and skills required at the time he needs them. The significant features of his job role are to:

- a. Arrange for supply of personnel and equipment to carry out containment and clean-up on land or water and for the maintenance operations to support these activities,

- b. Obtain the support and assistance necessary in order for him to evaluate the applicable response techniques and direct the subordinate functions,
- c. Organize and deploy the field forces and equipment,
- d. Maintain close contact with and give direction to the supervisors assigned to him,
- e. Alter work plans to respond to changing situations in the field and provide information regarding the effectiveness of execution for future planning purposes,
- f. Insure that proper records are maintained concerning field operations, supply usage, employment of contractors, outside assistance and surveillance, and accidents incurred,
- g. Arrange for and insure the satisfaction of personal needs of the field personnel,
- h. Build up or cut down on field activity in response to both the overall planning directions and the capability of the work forces to perform in the field under prevailing conditions,
- i. Through the Operations Coordinator, insure that company activities are communicated and coordinated with those of regulatory agencies and civic services who might be on-scene.

Procurement and Services Coordinator - The response to a major oil spill incident, especially if the operations cover an extended time period and the work area is large in extent, is very dependent upon logistical support of equipment, people, and services. The coordination of the services and purchasing requirements would be allocated to an individual

who is not directly involved in the direction and supervision of control and clean-up operations. This does not mean that all purchasing or supply is made from a central office or through one individual. It does mean that these are such significant elements of the operation that they need to be well managed and be recognized as having an important role in the organization. These procurement and service functions support the damage and clean-up control operations, and the coordinator's role is as follows:

- a. Arrange for the setting up of the required facilities to support the various offices on-scene and in the field,
- b. Determine the availability of secondary contractors and suppliers for equipment likely to be used,
- c. Provide those services and purchasing personnel needed to staff the operations headquarters' unit and to support the control coordinators in the field,
- d. Set up the communications network,
- e. Establish accounting and contracting procedures,
- f. Locate and procure any requested equipment,
- g. Administer the outside service arrangements,
- h. Monitor the supply and utilization of equipment and contractor personnel.

Repair and Damage Control Supervisor - Control of the spill at the source and immediate damage control are the first reactions in a spill incident. Damage control cannot occupy the total initial response effort, and so this control measure would be directed to the attention of a Damage Control supervisor at as early a time as is possible. The Damage Control

Coordinator performs as follows:

- a. Assumes direction of the operations designed to minimize loss of property, life and additional escape of oil,
- b. Arranges for specialist assistance from damage control and repair services,
- c. Coordinates with and complements the efforts of oil spill control groups,
- d. Interprets and transmits policy and program guidelines to damage control operating group (company, government and contractor's personnel).

#### F. Materials, Manpower and Logistics

This plan anticipates that certain equipment be on hand or readily supplied to respond to the wide variety of spill sizes and conditions that are statistically possible along the pipeline route. Various means are available to meet these equipment requirements such as supply from contractors, cooperative or exchange availability and purchase and stockpiling. Not all the equipment to satisfy the requirements of the largest, most complicated spill imaginable need be on hand since manpower and logistics limit its full application immediately (See Table 2). In the case of this pipeline, manpower availability and logistics are equally as significant to effective response as the material availability.

Materials - The material requirements for this plan are designed to give complete coverage to the pipeline route and insure early response to all areas followed by support from stockpiled equipment and out-

side sources indicated in Appendix B. Possible stockpile and equipment supply points are indicated in Figure 14.

The scope of materials anticipated for the wide range of possible response actions is shown in the following checklist:

1. Manufactured Booms
2. Booms Constructed of Natural or Synthetic Materials
3. Pumps and Skimmers
4. Commercial Absorbents
5. Natural Absorbents (straw)
6. Mulchers
7. Dispersants and Surface Tension Agents
8. Bird and Animal Cleaners, Noise Makers
9. Boats and Rafts, Spare Motors, Fuel
10. Anchors, Cable, Steel Posts
11. Vehicles (Jeeps, Trucks, Backhoes, Snowcats, Vacuum Trucks, etc.)
12. Aircraft including Helicopters and Float Planes
13. Photography Equipment
14. Tools (Rakes, Shovels, Brush Axes, Sledgehammers, Saws)
15. Post Hole Diggers and Fence Posts
16. Rope, Shackles, Pulleys, Soft Wire
17. Trailers (Kitchens, Quarters, Offices)
18. Relief Stations
19. Portable Radio Equipment
20. Office Supplies
21. Fencing (Hog Wire, Chicken Wire)

22. Fish Netting
23. Plastic Sheeting
24. Barrels, Tanks, Hose and Connectors
25. Chain Saws, Portable motors and gas supplies
26. Tanks, (Portable and Truck)
27. Safety Equipment, Explosion Meters, Life Preservers, Protective Clothing
28. Map Sets
29. Portable Lighting Equipment

In spite of the best planning and stockpiling of equipment, the response to spills usually requires additional equipment and supplies as well as some construction or alteration of equipment in the field. This plan anticipates on-scene construction devices, some of which are discussed in Appendix C.

In terms of the size of spills, the following guidelines are provided for major or basic equipment that might be required.

#### Small Spill

Shovels, Rakes, Pitchforks

Absorbents, Fibers, Sheet or Rolls

10' - 60' Boom Prefabricated or Natural

1 - 2 Trucks, Transport or Vacuum

1 Portable Radio

Maps

Plastic - Strip

Containers - 5 Barrels

10' - 100' Fencing Material

1 Small Earth Mover - Backhoe, Blade, Dozer

Medium Spill

Shovels, Rakes, Pitchforks, Miscellaneous Tools

Absorbents, Fibers, Sheet or Rolls

10' - 200' Boom - Prefabricated or Natural

1 - 7 Trucks, Transport or Vacuum

1 - 2 Helicopters

1 - 3 Portable Radios

Maps

Plastic - Strip and Sheeting

Containers, 10 - 20 Barrels, 1 or 2 Small Tank Trucks

50' - 200' Fencing Material and Miscellaneous Barrier Basics

1 - 3 Boats

1 - 2 Pumps and Skimmers

1 - 2 Small Earth Movers, Diggers, Etc.

Major or Critical Spill

The complete range from material checklist but generally:

100' - 1000' Boom - Prefabricated and Natural

2 - 4 Pumps and Skimmers

2 - 6 Trucks - Transportation, Vacuum and Tank

2 - 4 Portable Radios

Camera Equipment

Map Sets

1 - 2 Trailers - Kitchen Facilities, Toilets

- 10 - 25 Sacks, Absorbent
- 20 - 100 Bales Straw
- 2 - 6 Boats, Rafts, Barges
- 1 - 5 Helicopters, Airplanes and Float Planes
- 1 - 75 Miscellaneous Tools, Shovels, Pitchforks, etc.
- 100 - 500' Fencing and Barrier Fabrication Material
- 2 - 4 Earth Movers, Diggers, Blades, etc.
- 1 - 2 Remote Headquarters with Office Supplies, Communication Network, Containers, Barrels, Plastic Tanks, Portable Tanks, Tank Trucks

The standby equipment in portable units or packages that would be suited to the containment and clean-up of specific and general areas along the route is represented in kits described below. All of these would have to be helicopter, pickup or boat transportable.

River Units [3] - One container suitable for temporary storage and separation of oil, containing one portable T/R radio, 200' plastic enclosed boom with 8" floatation cells and 12" skirt weighted with chain and reinforced with steel cable, 200' hogwire fencing, 100' synthetic rope, 3 anchors, 100' hemp rope, sledgehammer, stakes and poles, one gasoline powered floating skimmer with hose, extra gasoline, one two-man inflatable raft, approximate weight 1000 lbs. total.

One container suitable for temporary storage and separation of oil containing one portable T/R radio, 200' of 8" absorbent boom, 2 anchors, 10 line floats, 200 sq. feet of absorbent sheet 4' X 1/2",

300' 3/4" nylon rope, 300' hemp rope, stakes and poles, sledgehammer, 100' hogwire fencing, 300' 3/8" steel cable, one gas powered diaphragm pump and hose featuring skimmer head, wirecutters, soft wire, one two-man inflatable rubber raft, one set of maps and miscellaneous items up to approximately 800 lbs. total weight.

One container suitable for temporary storage and separation of oil, containing one portable T/R radio, 100' of plastic enclosed boom with 5" floatation cells and 8" skirt weighted with chain, 100' hog wire fencing, 100' heavy duty plastic sheeting, 300' chicken wire, post hole digger, sledgehammer, and stakes, bow saw, 2 shovels, 2 rakes, 2 pitchforks, 2 brushhooks, 2 mattocks, 1 machete, 300' hemp rope, 200' steel 1/4" cable, U-bolts, clamps, wirecutters, soft wire, 2,500 sq. feet plastic pit liner, lumber (6) 2 X 12 X 6', nails, boots, gloves, waders, etc. up to 600 lbs. total weight.

Small Stream Units [2] - Two containers suitable for temporary storage of oil, containing 50' plastic boom with 5" floats and 8" skirt weighted with chain, 50' - 8" DIA. absorbent boom, 200 sq. feet sheet absorbent 3' X 1/2", 60' chicken wire, 100' nylon rope, 100' hemp rope, 120' plastic sheeting 3' heavy duty, soft wire, wirecutters, one portable gas engine snore type pump with skimmer head and hose, 5 sacks fiber absorbent, sledgehammer, steel posts, 2 shovels, 2 pitchforks, jet hose attachment for pump, one brush axe, one bow saw, lumber (3) 2 X 12 X 6', nails, rubber boots and gloves, 3 sheath knives, one set of maps, etc. up to 600 lbs. total weight.

Dry Land, Stream or Ice Unit [1] - One container to fit in pickup containing 100' of 8" absorbent boom, 5 sacks absorbent, 200 sq. ft. of absorbent sheet 4' X 1/2", 200' hemp rope, 100' hog wire fencing, 100' chicken wire, 100 linear feet of heavy duty plastic sheeting, 2,500 sq. ft. of plastic pit liner, 2 shovels, 2 rakes, 1 axe, 1 saw, sledgehammer and hammer, 1 chainsaw, lumber (6) 2 X 12 X 6', nails, soft wire, gloves, etc.

While stockpiling and unit packaging of equipment is desirable from the availability and time for response standpoints, it introduces a problem of maintenance and equipment replacement over the periods of non-use anticipated for a single pipeline. Such procedures would be incorporated into the final equipment supply program.

Sources of present local equipment availability are listed in Appendix B. Prior to operational start up of the proposed pipeline, additional and more specialized equipment of a scope listed above in the general materials checklist would be located and its availability determined in order to supplement the equipment on hand or in the area.

Manpower - Manpower requirements can vary from a few men and one supervisor up to the complement indicated previously in the major critical spill organization chart and the personnel requirements checklist. Manpower requirements may be filled from the following sources:

- a. Pipeline Operating Staff and Manager
- b. Contractor Manpower Pools

- c. Voluntary Assistance from Atlantic Richfield Company
- d. Colony Plant Management and Staff
- e. APL Departmental Operating Personnel and Management Staff
- f. Staff Assistance from Venture Partners and Other Associated Companies

Prior to operational startup, the personnel who would respond to a spill will be specifically designated from the above sources as to job function, name, location and phone numbers.

In terms of spill size, the following guidelines are given as to possible personnel requirements:

Small Spills

- 3 - 6 Laborers
- 2 Staff Advisors
- 1 Supervisor

Medium Spills

- 10 - 20 Laborers
- 2 - 3 Supervisors
- 2 - 4 Staff Advisors and Assistants
- 1 Director

Major Spills or Critical Spills

- 10 - 50 Laborers
- 2 - 10 Supervisors
- 4 - 10 Advisors and Assistants
- 1 - 3 Directors and Managers

Manpower and equipment alone are not the key to an effective contingency plan. Training and indoctrination covering responses to the unusual and infrequently experienced activities of oil spill are planned for those personnel assigned to the spill response organization, as well as general indoctrination for all operational personnel in preventive measures.

Logistics - Ultimately, the equipment and manpower must be deployed and employed in the actual spill situation following planning and indoctrination. When the spill escapes the formal confines of the pipeline system, the logistics of response are critical to effective action. The combinations of conditions and situations relative to an accidental spill are almost infinite and no plan is likely to satisfy all manpower, activity and equipment requirements beforehand. The following generalized logistics possibilities are set out as a concept of the complications to be anticipated and conditions satisfied when called for. Only the logistics of the major or critical spill situations are listed since the small and minor spill can be handled within the scope of the support requirements listed below:

- (1) Deliver one or more spill equipment units and 3 - 10 men to the control point within 1 - 4 hours at locations 5 - 50 miles from supply sources.
- (2) Deliver backup spill equipment (up to 500' of boom, 10 - 50 bags absorbent, 10 - 50 bales straw, 1 - 3 boats, 2 helicopters, one observation plane, 1 - 2 earth movers, communication equipment, 2 - 5 vehicles, 1 - 2 tank or vacuum trucks, and other requirements from material checklist and 5 - 20 men to the

- spill area in 4 - 8 hours from locations 50 - 250 miles from supply sources.
- (3) Deliver additional equipment and manpower as needed to a spill area covering 10 - 100 miles from source of supply distance up to 1000 miles.
  - (4) Muster and integrate into a working organization 5 - 15 managers, advisors and coordinators, 5 - 10 lead supervisors and assistants, 5 - 10 outside contractors, 5 - 10 field foremen and 10 - 50 laborers. (It is possible that as many as 100 people can be involved in some role or another from the clean-up to the corporate level.)
  - (5) Arrange for relief personnel for supervisors, foremen and laborers.
  - (6) Establish a communication and reporting system from remote and dispersed field locations to as many as four levels of supervision and management at different locations.
  - (7) Arrange for entry into any private or government property not already established by agreement prior to the spill incident.
  - (8) Staff, equip and organize one central command office, at a company facility, one operational control center located to be geographically convenient to the field operations, and 1 - 3 field control centers at remote out-of-town locations.
  - (9) Furnish transportation access by jeep, boat, or aircraft for advisors, assistants, and possibly federal and state observers and coordinators.

- (10) Provide field kitchens or food and water provisions and relief stations as appropriate for 1 - 3 remote field work centers.
- (11) Arrange for transport and disposal of recovered oil or oily debris to prearranged disposal sites.
- (12) Provide press or public relations or control agency briefing facilities.
- (13) Establish field pay centers, contract agreements, or claims offices if appropriate.
- (14) Maintain supplies and services for periods from 3 days to 3 weeks.
- (15) Arrange for withdrawal and recovery of personnel and equipment as the operations are phased down.

The above logistics checklist and the organization depicted in Figure 7 anticipate the most complicated spill conditions and followup response requirements for this specific pipeline, rather than for the average historical pipeline spill. The plan covers the largest and most critical spill that can be anticipated and will therefore insure against lack of preparation for any unusual or unexpected occurrence.

## X. Surveillance, Communication and Documentation

The field response activities for spills occurring from this pipeline are most likely to be remote from a permanent operating station and possibly out of the range of any established communication system.

The small- and medium-sized spill response may be carried out with limited communication from the clean-up scene. However, certain major spill situations, such as might result from a spill into the Colorado River, would require a relatively continuous surveillance and communication with the area of exposure in order to control operations.

Planning, decision making, and management of a complicated response action, involving a relatively large and mixed functional group of personnel requires establishment of orderly reporting chains and communication links for gathering or conveying information. This need for non-routine communication between groups and the required physical communication facilities are outside the normal day-to-day demands. These communication links are identified as critical requirements of the pre-spill planning.

Another important factor in providing good communication is the development and supply of a standard set of maps which can be referred to by all parties, including regulatory observers. The map packet would be finalized subsequent to completion of construction and will include maps showing valve locations, response areas, access routes, Colorado River details and large scale maps of primary recovery centers at criti-

cal points away from the route.

#### A. Surveillance

Surveillance would be conducted by foot, vehicle, boat or aircraft as the conditions dictate. Surveillance activities can be coordinated with logistic transportation trips; however, in some instances, airplanes, etc., should be reserved for surveillance. This is particularly desirable for fulfilling any joint observation function with the appropriate regulatory agencies. Photographs, from both ground level and the air may be used to supplement visual surveillance and for documentation.

#### B. Communication Systems

The operation of the pipeline system and the conduct of normal operations requires a relatively complete communication system linking the Operations Control Center, pump stations and terminal, and operating and supervisory personnel. This will be a combined telephone and VHF mobile radio system. The oil spill communication system will be developed as an extension of these elements. Advanced field centers will be supplied with portable VHF units, and relay centers using remote control circuits or repeater systems on land or by air relay will be established as required. These field work and supply centers will be connected to the on-scene headquarters in the appropriate townsite. Within the pipeline spill area various government groups such as the U. S. Park Service utilize mobile communication effectively in the conduct of their operations. The management offices, operations con-

trol center, plant site and remote response control centers in Moab, Grand Junction or Rangely are readily connected through established commercial telephone facilities.

### C. Communication Links

Emergency oil spill response activities usually require certain deviations from the normal day-to-day reporting and directing procedures. This is a result of the shortened time frame for conducting the operations, possible involvement of personnel who normally do not work with each other on a routine basis, and in the case of a pipeline leak remote from established offices, reporting of information back through a number of groups to the overall planning and policy levels.

The following internal communication and reporting links are significant to the activities conducted during the oil spill response period:

#### 1. For Reporting and Information Dissemination

##### Operational Control

- Foremen
- On-site Superintendents
- Clean-up, Repair and Service Supervisors
- Operations Coordinator
- On-scene Commander or Operations Director
- Executive Management

##### Observation and Data Gathering

- Surveillance Observers
- Biological and Ecological Advisors
- On-site Supervisors
- Oil Spill Coordinator
- Documentation Team
- On-scene Commander

## Coordination of Services

- Transportation Center
- Communication Center
- Staging Areas
- Purchasing Coordinator
- Technical Evaluator
- Services Coordinator
- Operations Coordinator
- On-scene Commander

## 2. Input to Planning Meetings

### Response Program

- On-scene Commander
- Operations Coordinator
- Technical Evaluator
- Oil Spill Control Coordinator
- Repair Control Supervisor
- Procurement and Services Coordinator
- Oil Spill Control Advisor

### Progress Reporting

- On-scene Commander
- Public Relations Assistant
- Government Liaison
- Claims Assistant
- Services Coordinator

### Liaison Directions

- On-scene Commander
- Public Relations
- Claims
- Government Liaison
- Technical Evaluator
- Legal
- Insurance

## 3. Documentation Debriefing

- On-scene Commander
- Ecological and Biological Specialist
- Wildlife Specialist
- Surveillance and Documentation Teams
- Volunteer Help Assistant
- Public Relations
- Government Liaison
- Oil Spill Control Coordinator

#### 4. Policy and Overall Direction

- Executive Management
- On-scene Commander
- Legal
- Public Relations
- Environmental

Communication with regulatory agencies and the press will be initiated on an informal and person-to-person basis following prescribed procedures and policies; however, group communication sessions are anticipated under certain situations as a desirable way to disclose information concerning the spill response progress. Example groups are:

##### Regulatory Agencies

- EPA On-scene Coordinator
- USCG Representative
- State On-scene Coordinator
- Operations Coordinator or On-scene Commander
- Oil Spill Control Coordinator
- Public Relations Assistant
- Documentation Supervisor

##### Federal and State Agencies

- EPA Representative
- BLM
- U.S. Park Service
- State Water Pollution Control Representatives
- State Wildlife Resources Division
- Bureau of Reclamation
- Department of Transportation - Pipeline Safety
- Other Federal and State Agencies On-scene
- Operations Coordinator or On-scene Commander
- Public Relations Assistant
- Government Relations Assistant
- Documentation Supervisor
- Oil Spill Control Advisor
- Other Assistants and Advisors as Needed

##### Civic Officials and the Press

- Local and Transient Reporters
- Civic Leaders, Police and Fire Officials
- Health and Water Department Representatives

On-scene Commander  
Public Relations Assistant  
Documentation Supervisor  
Government Liaison Assistant

#### D. Documentation

The emergency climate associated with some oil spills makes early detailed documentation difficult. However, through pre-spill indoctrination emphasis on the importance of keeping notes by field supervisors, the observations and facts in the early hectic response can be recorded and later made part of the internal documentation report to be made of spills. Documentation can vary from a brief report of the spill occurrence circumstances to a detailed report supported by special studies concerned with impact assessment or analysis of future potential environmental impacts. While documentation of spills is important for internal purposes, including future training and indoctrination of support personnel, the orderly collection and collation of information is valuable from the standpoint of verifying or supporting any documentation papers prepared by regulatory agencies.

The documentation function is to be a partial function of all supervisors and observers; however, overall responsibility will be assigned to the Documentation Supervisor.

## XI. Special Programs

This Contingency Plan anticipates the possibility that the programs described below might need to be implemented when these problem situations are encountered. The baseline study performed in connection with the pipeline routing (2) provides information regarding wildlife concentrations, population centers, etc. The study indicates that there are a few areas that might require initiation of some special programs such as wildlife dispersion, wildlife rehabilitation, supply and protection of potable waters and environmental impact monitoring in the event of a spill. The particular locations identified as having a potential for a significant environmental impact as a result of exposure to oil have been taken into account in the response planning by areas discussed in Appendix D.

### A. Wildlife Dispersion

Should wildlife (for instance migratory birds such as may be present in the marsh area at Moab) be endangered by potential exposure to oil accumulations on land or water every effort will be made to disperse wildlife by noisemakers or restrict their movement into areas of possible contact with any spilled oil. Fish and game agencies will be alerted to any potential hazards to known wildlife in the area.

### B. Wildlife Rehabilitation

While deer populations are high in some areas, they could be expected to move out of a spill area except for exposure at water sources. Much

of the route along the pipeline is not overly populated with wildlife and waterfowl that would be exposed to spilled oil except localized prairie dog colonies and species noted in Appendix D. However, should exposure occur, the fish and game authorities or local Audubon groups can provide assistance to company personnel engaged in rehabilitation activities.

Outside consultants or specialists in bird care are included in the resource availability listing in Appendix B and could be contacted if required; however, pre-planned internal indoctrination on bird wildlife care will be covered in the training programs.

#### C. Potable Water Supply

The inventory pointed out some of the usages of potable water along the route such as water wells, stock ponds and springs. These sources could be subject to exposure to oil from a pipeline break. Emergency procedures might have to be initiated to provide drinking water during the clean-up period if contamination of potable water occurs. While such activities may be outside of the oil spill clean-up activities, they are included as a special response action that must be anticipated in the Contingency Plan.

#### D. Unrequested Private Citizen Assistance

The level of planned response in cooperation with regulatory and supervisory agencies and civil services should be sufficient to do the best possible job of clean-up of an oil spill from the pipeline.

However, the possibility always exists that unrequested private citizen assistance might be volunteered or spontaneously initiated. In such a circumstance, special citizen liaison arrangements may be required.

Such participation by individuals who may lack experience and training for work in a potentially hazardous condition can lead to their injury.

#### E. Environmental Impact Monitoring

The need may arise for conducting special environmental monitoring programs in conjunction with spill response procedures. These might be conducted by in-house environmental specialists or by outside consultants having expertise in a particular scientific field.

An example of such a response oriented program might be investigation of biodegradation vs. revegetation as a clean-up procedure in conjunction with restoration of an area exposed to spilled oil. Immediate stripping or cutting of vegetation and trees might then be temporarily deferred and deemed unnecessary.



## XII. Safety

While the shale oil product to be transported in this pipeline is not highly volatile, it must be considered as potentially hazardous.

Normally the processes of evaporation and emulsification occur within a short time and this tends to alleviate some of the hazardous conditions which might be associated with working in a spill area. Supervisors and the personnel under their direction who are involved in the actions taken in response to a spill situation would consider protection of human safety a first priority. This safety interest extends to public exposure as well as to the safety of employed contractors and company personnel.

The following guidelines and alerts are pertinent to operations associated with spill response actions. These following rules are cited to insure expansion of the normal operating safety practices and procedures listed in company operating manuals and in OSHA regulations so as to cover oil spill activities.

### A. General

- (a) Prior to going on the job, personnel will be reminded of the potential hazards.
- (b) Instructions to contractors should include a requirement for safety precaution review and enforcement of practices.
- (c) Potentially hazardous areas and conditions should be defined and restrictions placed upon personnel and operations to be

allowed.

- (d) Personnel specifically designated to provide safety and policing actions will be provided as the situation dictates with instructions to restrict unrequired people from access.
- (e) The public and civil service units will be alerted to potentially hazardous conditions and their assistance requested for evaluation, restriction, or physical help.
- (f) Equipment to be employed will be checked and verified as restrictively designed to prohibit ignition of the residue product.
- (g) No smoking areas should be designated.
- (h) Repairs should be conducted with safety in mind. When required to release oil to provide safe working conditions every precaution should be taken to prevent uncontrolled release without agency approval unless an immediate decision is required to prevent hazard to human life.
- (i) In addition to human safety, potential hazards to livestock and wildlife should be noted and preventative safety measures initiated.

#### B. Equipment and Operations

- (a) Motors on skimmers, pumps, vehicles, and boats are the most likely items of clean-up equipment constituting an ignition hazard. While equipment stockpiled for spill response would be designed to eliminate this possibility, it still should be inspected for a hazardous condition and precautionary practices observed.

Contractor equipment not normally used for oil clean-up operations must be inspected and used with extra care.

- (b) Repair operations, particularly the use of cutting torches and welding equipment must be recognized as having an ignition potential. In spite of the non-routine operations, normal safety precautions should be taken under the emergency, remote and abnormal use conditions that can arise during oil spill response.
- (c) Any accumulation, temporary surface storage or permanently disposed oil soaked debris should be considered a spontaneous combustion source.
- (d) Equipment should be cleaned prior to storage.
- (e) Those activities of setting booms, operating floating skimmers and collecting absorbents require personnel to work in or over oil surfaces; so measurement should be made to test for explosive conditions and hydrocarbon vapor concentrations whenever possible.
- (f) When conducting excavation and earth moving operations during land cleanup, especially in rocky areas, safety measures must be employed to prevent ignition from sparks.
- (g) It may be required to work around the clock, and nighttime operations must be approached with extra care. The use of field lighting introduces a possible ignition hazard.
- (h) Occasionally, burning operations might be conducted as a clean-up procedure to remove oil or dispose of oil soaked debris. While such operations are conducted with approval of proper agencies and are well supervised, extra safety precautions would be taken to prevent loss of control.

- (i) The possibility of personnel having to conduct clean-up operations on the Colorado River, in rugged mountain terrain, and during adverse winter weather conditions requires special safety instructions and supply of equipment such as life preservers and special clothing, both for protection against exposure to oil and weather.

### XIII. Training

The training requirements to activate and support this Contingency Plan and pre-spill preparation by operating personnel assigned to spill response activities previously mentioned. A followup program for training and orientation is planned prior to the start up date of the pipeline to make this plan operationally effective.

In addition to initial training to implement the plan, on-going and long-range review training will be programmed. This will insure against any obsolescence of an understanding of responsibilities and skills as a result of personnel changes or lack of experience due to not having had to put the plan into action. It is likely that there will be no leaks from the line for many years and even possible that a leak will never occur. However, developing an oil spill plan and keeping it active is very similar to actions taken in fire fighting preparation and the training would generally follow this procedure.

One of the training methods that can be employed to test reporting procedures, equipment availability and skills in equipment deployment is the occasional call for spill drills.

A particular spill situation can be tested by setting up training problems to be carried out internally by those responsible for keeping the Contingency Plan up to date. Planned or emergency drills are to be employed; however, caution must be taken in this apparent emergency type drill to insure that no hazards to personnel are created or that a

false alarm report is not made to regulatory agencies or the press. Test problem alerting would be prefaced with "This is a test; there is no leak, but carry out your responsibilities and follow procedures as if it were the real thing."

A training example follows:

The environmental coordinator arranges a spill drill with the Pipeline Superintendent and the Operating Control Center Supervisor.

(Critical links in reporting procedures and pipeline shutdown.)

Problem: Assume a medium sized line leak is detected by alarm and monitoring at the OCC.

Scope of Problem Solution:

1. Test the internal alert and standby response procedure.
2. Test the time required to find the point of the leak.
3. Given a theoretical leak point (such as in Area 2 between the shut-in valves at the top of Roan Plateau and at the bottom of East Salt Creek Canyon @ MP 48, test the time to isolate this section of the line.
4. Estimate the amount of oil that could have been lost and estimate the magnitude of response required.
5. Test the availability of internal and outside manpower.
6. Test the availability of internal and outside equipment requirements (such as surveillance aircraft used for finite location of leaks).
7. Develop the techniques and methods to be employed for containment, recovery, and disposal for this specific situation.

### Training Problem Sequence

1. OCC will notify Pipeline Superintendent of possible leak and that they have shut in pipeline.
2. Pipeline superintendent will notify Pipeline Manager of the problem situation and initiate action to find theoretical leak point.
3. Pipeline Manager will place pre-designated response team on standby and alert staff advisors of the test problem and their expected response.
4. Pipeline Superintendent will investigate valve shut in capability and notify OCC and Pipeline Manager of situation and required response.
5. Response action will be initiated according to the plan up to the point of assembling critical work crew and first line supervisors at an Operating Control Center or scene of leak.
6. The environmental coordinator will prepare a critique of the drill and follow up with appropriate supervisors, managers and staff to eliminate any problem areas noted.

Another form of training is also necessary for those in-house or external support personnel who would be expected to deploy spill control equipment. Actual handling of the equipment is most conveniently done at regular maintenance or equipment check time. Equipment, such as a gas engine driven pump, is of little value if it is not operative; and unless the men who would be expected to set an anchor and deploy a boom in the Colorado River have actually experienced the operation, the required response timing is not likely to be satisfied.

Additional training steps in the problem example outlined above might occasionally be to:

1. Assemble the applicable manpower and equipment at the pre-designated recovery points on East Salt Creek to discuss the conditions and response actions.
2. Deploy or construct the devices applicable to the conditions at the time the problem was presented.

Training and advance preparation are considered to be significant factors in the implementation of APL's oil spill contingency plan for this proposed pipeline.

## VITA

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### EDUCATION:

B. S. 1949 Chemical Engineering, Purdue University,  
Lafayette, Indiana

### PROFESSIONAL AFFILIATION:

Member of Society of Petroleum Engineers of AIME.

### GENERAL EXPERIENCE:

1949-1972: Engineering, operating and management experience in  
petroleum industry with Sun Oil Company.

- (a) Petroleum exploration and development covering  
all phases of drilling and production operations,  
economics, reservoir evaluations, personnel develop-  
ment, training, administration, and management of  
engineering and operating functions. (21 years)
- (b) Environmental control management at corporate level  
with concentration of effort on the organization and  
implementation of oil spill prevention and control  
functions. (2 years)

1972-Present: Independent consulting activities involving environ-  
mental impact and operational control analysis; oil  
spill technology and contingency planning; government  
liaison with regulatory and lead agencies.

### PROFESSIONAL RECORD:

#### Positions:

Employed by Barnsdall Oil Company (later merged into Sunray DX; then into  
Sun Oil Company, last employer) April, 1949, Los Angeles, California.

Drilling Engineering	1949 - 1950
Reservoir Engineering	1950 - 1951
Productions Engineering	1951 - 1955
Petroleum Engineering	1955 - 1960
District Engineer	1960 - 1961
Division Engineer	1961 - 1969
Manager of Engineering	1969 - 1970
Coordinator of Oil Spill Control	1970 - 1972
Independent Consultant	1972 - 1973

## FUNCTIONAL EXPERIENCE:

- |  |   |
|--|---|
| Drilling Operations                        | - Field work and programming, individual well, field development and design practices.  |
| Production Operations                      | - Well and facility equipment design and operational control.   |
| Reservoir Engineering                      | - Field and planning studies, individual well field-wide, and unitization control.  |
| Petroleum Engineering                      | - Exploitation geology and field development drilling and producing programming. Supervision of geological and reservoir functions. |
| Economics, Planning and Reserve Evaluation | - Long range planning and development of optimum recovery and economics programs. Acquisitions and sale evaluations.                |
| Environmental Analysis                     | - Contingency plans; operational controls; impact assessment; impact statement preparation  |

## MANAGEMENT AND ADMINISTRATION:

- |   |   |
|---|---|
| District and Division Engineering Manager | - All phases of gas, gas plant and petroleum engineering, budget and capital expenditure control.                                     |
| Manager of Engineering                    | - Engineering Department goals and effectiveness, hiring, training, salary administration, standards and engineering quality control. |
| Manager of Production                     | - Temporary management of operating and geological and engineering function during Departmental reorganization.                       |
| Environmental Coordinator                 | - Oil Spill Prevention and Response Program, corporate-wide evaluation, planning and execution.                                       |

## OIL SPILL CONTROL:

Past member of API Oil Spills Committee, serving from 1969-1972.

Developed the Oil Spill Prevention and Response Program for Sun Oil Co. covering corporate operational functions of Exploration and Production, Marine, Pipeline, Manufacturing and Marketing.

Prepared the major spill contingency and response plan for Sun Oil Company's Department and Corporate-wide oil spill cleanup actions.

Provided operating and technological support to Great Canadian Oil Sands during major spill cleanup actions in Alberta, Canada. Represented GCOS on technical input to government response team when government intervened.

Prior to operational start-up, coordinated the development of Sun's Response Plan and oil spill equipment training program for a new refinery on the coast of Puerto Rico.

Spent the equivalent of one year's time counseling, advising and training operating units regarding environmental control management, oil spill prevention and response techniques.

Through participation and analysis of spill occurrences, acquired good working knowledge of the causes of spills and effectiveness of plans and equipment during cleanup.

Investigated the state of the art of oil spill effects and cleanup technology as it applies to Arctic conditions, and developed needs for future development work.

Provided planning, organization, direction and motivating support for all phases of a major oil company's program and efforts directed at oil spill prevention and control, consistent with imposed regulatory and environmental obligations.

Conducted a study of the equipment and cleanup service requirements for a company engaged in research, design and supply of oil spill control equipment.

Observer/recorder for Johns-Manville, the prime contractor on High Sea State Test of a U.S.C.G. Boom Development Project.



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### Regulatory and Governmental Agency Contacts

The major spill incident can by regulations and public interest come under the direct attention of various governmental agencies. The policies and procedures reflected in this Contingency Plan intend for any spill response to be carried out in a manner that would only make it necessary that regulatory agencies record or observe the effectiveness of the clean-up operations. This plan, however, anticipates that advice and potential assistance available from the various public offices concerned with oil spill consequences will be incorporated into the response actions.

In the event of a leak from this pipeline, the appropriate regulatory agency must be contacted and other agencies and civic services would be advised by APL or those agencies who have assumed responsibility for secondary notification of affected parties.

The following contacts are provided to insure coverage of the concerned public offices:

Environmental Protection Agency  
Region VIII (includes Colorado and Utah)  
1860 Lincoln Street  
Denver, Colorado 80203

24-hour Oil Spill Reporting (303) 837-3880

Response Team Coordinator  
Richard M. Jones (303) 837- 2468

Colorado Water Pollution Control Division - Denver, Colorado  
Oil Spill Reporting (303) 388-6111 ext. 231

Non-Duty Hours:

Frank Rozick	377-4689
Fred Matter	771-0254
E. B. Pugsley	771-2088

Utah State Division of Health, Water Quality Section  
44 Medical Drive  
Salt Lake City, Utah

24-hour Spill Reporting (801) 328-6145

Water Quality Personnel:	(Off-Duty Phone Nos.)
C. K. Sudweeks	(801) 467-4962
N. M. Chamberlin	(801) 272-2851
R. M. Hinshaw	(801) 295-2248

U. S. Coast Guard  
2nd District (includes Colorado Area)  
St. Louis, Missouri Duty Officer (314) 622-4614

12th District (includes Utah Area)  
San Francisco, California Duty Officer (415) 556-5500

U. S. Park Service  
Canyonlands & Arches National Parks  
Moab, Utah  
R. I. Kerr (801) 259-7165

Bureau of Land Management  
Craig District (303) 824-3289  
Marvin Pearson

Grand Junction District (303) 242-8515  
Tom Owen

Monticello District (801) 587-2247  
Frank Shields

Moab Area (801) 259-7231  
Marvin Jensen

U. S. Corps of Engineers  
Sacramento District (includes Utah Area)  
Sacramento, California  
Duty Hours (916) 449-2233  
Non-Duty Hours (916) 452-1535

U. S. Army Continental Commands

6th U. S. Army (includes Utah Area)  
Presidio of San Francisco, California  
Duty Hours (415) 561-3891  
Non-Duty Hours (415) 561-2497

U. S. Bureau of Sport Fisheries and Wildlife  
Region 2

Albuquerque, New Mexico  
Duty Hours (602) 997-8291

Colorado Game, Fish and Parks

Grand Junction Region  
Duty Hours (303) 243-3395

UTAH - Wildlife Resources

Salt Lake City, Utah  
J. E. Phelps, Director (807) 328-5081

U. S. Bureau of Reclamation

Highline Canal  
Grand Junction, Colorado

U. S. Department of Transportation

Office of Pipeline Safety  
Washington D. C. (202) 426-2393

Federal Railroad Administration

Washington, D. C.

Colorado State Highway Patrol

Grand Junction Division (303) 246-7447

Colorado Division of Water Resources

Water Division No. 5  
Glenwood Springs, Colorado

Utah Division of Water Resources

Salt Lake City, Utah (801) 328-5401

Utah Division of Water Rights

Salt Lake City, Utah (801) 328-5671

U. S. Forest Service

Intermountain Region  
Ogden, Utah (801) 399-6409

Rocky Mountain Region

Denver, Colorado (303) 233-6186

Moab City Offices

City Hall (801) 259-5121  
Police Department (801) 259-4331  
Fire Department (801) 259-5551  
Water and Sewer Dept. (801) 259-5121

Rangely City Offices

City Hall (303) 675-8611  
Fire Department (303) 675-8511  
Police Department (303) 675-8515

Grand Junction City Offices

City Hall (303) 243-2633  
Fire Department (303) 242-2900  
Police Department (303) 242-2522

Utah State Highway Patrol

Salt Lake City, Utah (807) 328-5621  
Price, Dispatch Office (807) 637-0893

A P P E N D I X    B



## A P P E N D I X    B

### Resource and Equipment Availability

Resources and equipment available to support the required responses would come from the present sources and those to be developed during the next three to four years prior to this pipeline's operation.

It is planned that equipment will be available to support this plan either from company stockpiles or cooperatives and other industry associations in addition to the third party contract services and basic fabricator and manufacturer outlets shown.

#### 1. Transportation

##### a. Aircraft (airplanes and helicopters)

Canyonlands Aviation, Moab	(801) 259-7766
Hub Flying Service, Moab	(801) 259-7781
Sky Choppers, Inc. Grand Junction	(303) 243-9313
Mile Hi Service, Grand Junction	(303) 242-2264
Rocky Mountain Helicopter Service, Montrose	(303) 249-6555

##### b. Boats

Tex's Tour Center, Moab	P. O. Box 67
Alpha-Action Tours, Moab	(801) 259-6207
Tag-Along Tours, Moab	(801) 259-6690
Canyonlands by Night	
U. S. Park Service, Moab	

##### c. Four Wheel Drive Vehicles

Hertz, Grand Junction  
National, Grand Junction  
Avis, Grand Junction

##### d. Snowmobiles

Pollard Company, Rangely	(303) 675-2277
Rampart, Inc., Rangely, Moab, Grand Junction	(303) 645-6475

## 2. Trucks

### a. Vacuum

Lee's Tank Service, Moab	(801) 259-6204
Honey Dipper Septic, Moab	(801) 565-9424
Ron Septic Service, Grand Junction	(303) 242-7857
Goodwin Septic, Grand Junction	(303) 243-2783
Valley Septic, Meeker	(303) 878-5837
Routt Sanitation, Milner	(303) 879-0959

### b. Hauling

Pollard Cont. Service, Rangely	(303) 675-2277
Petro-Tank Trucks, Craig	(303) 824-5717
Northwest Carriers, Inc. Moab Grand Junction	(801) 259-5149

## 3. Contractors

### a. General

Coates Construction, Moab	(801)
Moberey Construction, Meeker	(303) 878-4463
Oil Field Construction, Meeker	(303) 878 5636
DACO Construction, Inc., Grand Jct.	(303) 242-2170
Honnen Equipment Company, Grand Jct.	(303) 243-7687
Tri State Tool Co., Inc., Grand Jct.	(303) 243-2133
Larry Dozer Service, Rangely	(303) 675-8862

### b. Pipeline

Fox Pipeline Construction Co., Rangely	(303) 242-8686
Kipp Construction Co., Grand Jct.	(303) 242-0779

### c. Oil Field Service

U. C. Stieger, Rangely	(303) 675-8581
Rippy, Inc., Craig	(303) 824-5811

## 4. Equipment and Supplies

### a. General

Moab Brine Company, Moab	(801) 259-5751
Prichard Transfer, Moab	(801) 259-5656
Plateau Equipment Supply, Grand Jct.	(303) 242-4530

b. Pumps

Fritz-Erickson Mining Company, Moab	(801)
Beeman Drilling Company, Moab	(801)
Grand Junction Pipe & Supply, Grand Junction	(303) 242-8445
Munro Supply, Inc. Grand Jct.	(303) 242-6810
Mountain States Company, Craig	(303) 824-6560

c. Straw

Generally available along the route  
Intermountain Farmers Associate,  
Price (801) 637-0652

d. Portable Lighting Equipment

e. Backhoes, Small Earth Moving Loaders

f. Portable Toilets

Routt Sanitation, Milner (General Contractors)	(303) 879-0959
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g. Radio Telephone Mobil Units

Mountain Bell, Rangely	(303) 675-2233
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h. Radio Equipment

Motorola Communication, Inc., Grand Junction	(303) 242-3803
Wilson Radio Communication, Rangely	(303) 675-2209

i. Oil Spill Equipment

(1) Boom Manufacturers

Kepner Plastics, Torrance, California  
Bennett Boom, Vancouver, B. C.

(2) Absorbents

Johns-Manville, Denver, Colorado  
Grefco, Inc., Los Angeles, California

(3) Skimmers

Bovard Supply, Denver, Colorado

(4) Chemicals

Corexit  
Shell Oil Herder

5. Environmental Specialty Services

Frederic Wagner - Utah State University  
Phillip Stanton - Bird Cleaning, Upton, Massachusetts  
Dr. J. L. Naviaux  
National Wildlife Health Foundations  
Pleasant Hill, California (415) 939-3456  
Woodward-Envicon, Inc., San Diego, California (714) 225-9381  
Bio-Test Laboratories, Northbrook, Illinois (312) 272-3030

6. Company or Affiliated Operations in Area

ARCO Pipeline Company  
Bartlesville, Oklahoma (918) 336-8043

Atlantic Richfield Company  
Rocky Mountain District  
Denver, Colorado (303) 266-2460

ARCO Pipeline Company  
Long Beach District (213) 423-7319

7. Other Pipeline Operations in General Area

Chevron Pipeline Company  
Rangely, Colorado (303) 675-2133

Texas-New Mexico Pipeline  
Midland, Texas (915) 682-2531

Union Oil of California Pipeline Company  
Moab, Utah (801) 259-5817

8. Industry Groups

Colorado Petroleum Council  
Denver, Colorado (303) 534-8261

Utah Petroleum Council  
Salt Lake City, Utah (801) 363-5757

A P P E N D I X   C



Control and Clean-up Equipment Applications

Many methods and control techniques have been established through practice, but new approaches are developed in the field as the necessity arises. Each spill and specific environmental or operational condition will dictate the approach to be taken and the equipment to be employed in certain critical use areas; however, in general the measures shown in Table 3 are expected to be employed or restricted as indicated.

The control techniques described in general in Sections IV and V can be hampered by the following natural influences:

1. Storms causing high winds and accelerated runoff.
2. Severe cold, ice and snow.
3. Weekend and nighttime occurrences.
4. Impassable terrain.
5. Rocky shorelines and excessive debris.

While such conditions can be anticipated, they sometimes extend the application of equipment and manpower capabilities beyond the point of practical and safe application.

The employment of the equipment and adaptation of techniques to the conditions along this pipeline route described in the following subsections of this part are applicable to the route response areas described in Appendix D and the specific response designs in Appendix E.

T A B L E 3

## CONTROL TECHNIQUES FOR VARIOUS CRITICAL USE AREAS

R - RECOMMENDED  
 N - NOT RECOMMENDED  
 O - OPTIONAL  
 X - NOT APPLICABLE

USE	USE											
	ABSORPTION	BYPASS DIVERSION	MECHANICAL CONTAINMENT	MECHANICAL REMOVAL	CHEMICAL DISPERSANTS	NON-TOXIC CHEMICAL COLLECTORS	SINKING AGENTS	BURNING	BIODEGRADATION	AGITATION	FIRE REDUCING FOAMS	DEFER FACILITY USE
POTABLE WATER INTAKES	O	R	O	R	N	O	N	N	N	N	X	R
POPULATED AREAS	R	R	O	R	N	O	N	N	N	O	R	R
FISH SPAWNING	O	R	O	R	N	O	N	N	N	N	N	X
FIRE HAZARD	O	R	O	R	R	O	N	N	N	R	R	R
WATER FOWL	R	R	O	R	O	O	N	N	N	O	X	R
STOCK PONDS	R	R	R	R	N	R	N	R	N	N	X	R
SPRING OUTLETS	R	R	O	R	N	O	N	O	N	N	X	R
RECREATION	R	O	R	R	N	O	N	N	N	O	O	R
INDUSTRIAL WATER INTAKES	O	R	O	R	N	O	N	N	N	N	X	R
BOTTOM AQUATIC LIFE	O	O	O	R	N	O	N	O	N	N	N	X
TIMBER	O	R	N	O	O	X	X	N	R	X	O	O
SHORELINES	R	O	O	R	N	X	X	O	O	O	O	O
APPROACH TO CRITICAL USE AREA	R	R	R	R	N	O	O	O	N	O	O	O

1. Field construction of booms, skimmers, barriers, etc., Figures 8 and 9.

a. Log Booms - Solid booms without below water skirts can be constructed of poles, posts of fallen trees stripped of branches. These booms are useful in swift rivers, especially in inaccessible areas since natural materials can be used for the barrier part of the boom. Logs may be linked together along a steel cable or rope and the joints closed by wrapping with canvas or plastic.

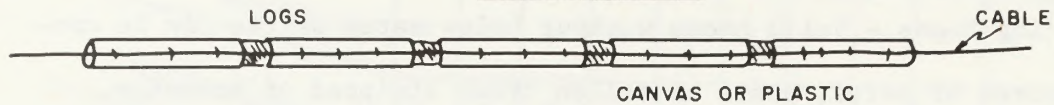
This type of boom can prove to be almost as effective as skirted booms to divert or deflect oil in very swift waters since skirts on booms tend to be ineffective at water rates over one foot per second (perpendicular to the containment system).

The mass of a log boom tends to make its movement and relocation difficult, especially if it must be moved with the power boats available in this area.

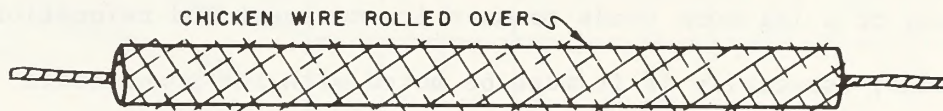
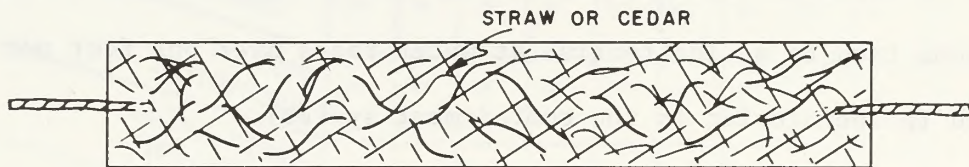
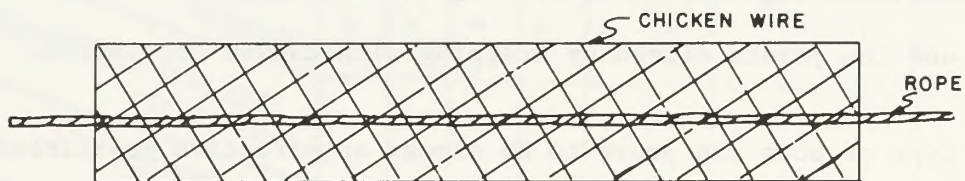
b. Semi-Barrier Booms - Booms which act as semi-barriers but having some absorptive capacity can be constructed in the field using chicken wire and filler materials such as straw, hay, willow branches or pine and cedar boughs. This type of boom is constructed by laying cable or rope lengthwise over the wire and piling the filler material on top of both. The chicken wire is then folded and wired into a roll with the cable protruding. The end sections are then closed off.

Figure 8  
FIELD CONSTRUCTED BOOMS

LOG BOOM



SEMI-BARRIER BOOMS



ABSORBANT BOOMS

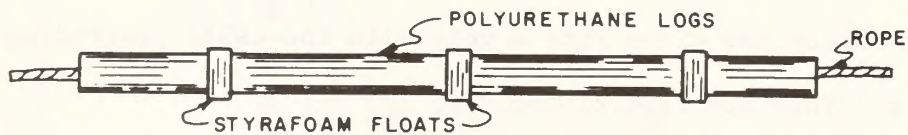
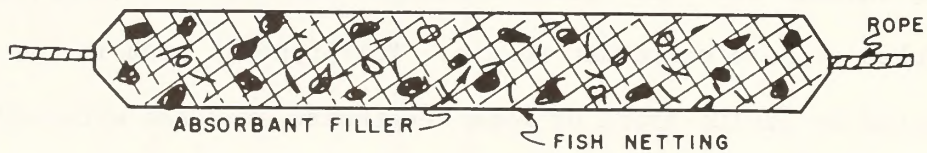
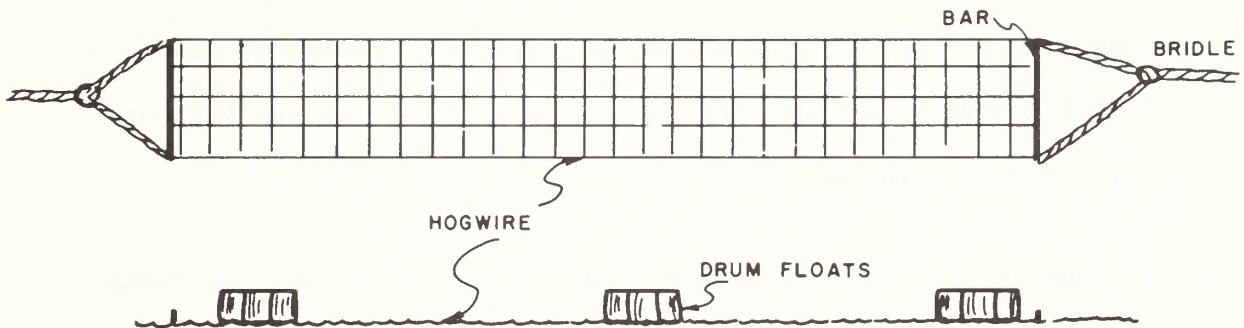


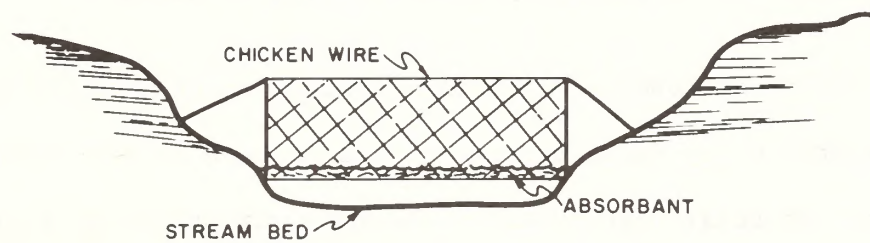
Figure 9

## FIELD CONSTRUCTED BARRIERS

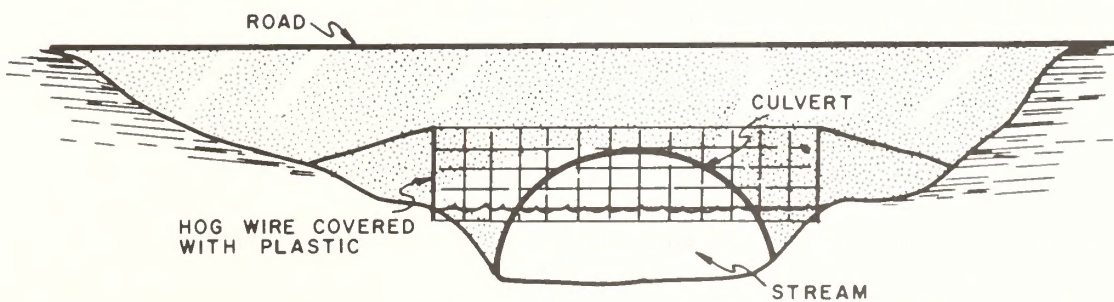
### DEBRIS BARRIER



### SEMI-ABSORBANT BARRIERS



### RETAINING BARRIERS



This barrier can also be used to divert the offshore oil moving with the fast flow current system of the river into the shoreline. Oil will be absorbed by the barrier to some extent, depending upon the filler. The flow of water through the semi-barrier also tends to create an eddy current behind the barrier and further diverting oil to shore.

A boom of this type is somewhat easier to handle than log booms because of the lesser weight; however, under prolonged use supporting flotation may have to be added to give the boom free-board. An advantage of this boom is that subsequent disposal in the field can be accomplished by burning or burial.

c. Absorbent Booms - A special application of the semi-barrier boom previously described is to fill chicken wire or fish net with commercial high capacity absorbent materials or string polyurethane rolls along a hemp or nylon line to form an absorbent barrier. These booms can be used to divert oil in swift water and also be used as an absorbent barrier to contain and collect oil in quieter water. Chicken wire booms may be refilled with natural materials and the polyurethane roll booms can be squeezed out and used again.

d. Semi-absorbent Barriers - In small streams a barrier may be constructed across the stream either at right angles or at an angle from bank to bank when high flow rates are encountered. The backup material, or barrier base, can be made of chicken wire,

hogwire, or rope. These materials provide a support for brush and willow-like growth which is found along some streams in this area.

Various other materials such as straw, fir, fibers, etc., can be fixed between two layers of wire to give body to the barrier or can be strewn on the water and floated against the barrier from a point upstream to bridge on the barrier supporting material. Another application would be the use of polyurethane foam sheets fixed to chicken wire. An advantage of this material is that it can be replaced and used over again after it has been rung out. Absorbent barriers are more effective when water flow rates are low and many times can be used to remove trace quantities or a sheen of oil from the surface of flowing or static water.

Semi-absorbent barrier devices can be used behind, in front of, or on bridge supports. The absorbent material can be readily replaced from time to time under such conditions of easy access and logistic support.

e. Barriers and Retention Structures - In small streams having either low or high rates of flow, retention devices may be constructed or a use made of permanent structures for the purpose of building up an oil storage reservoir while still allowing essentially normal flow of water.

This may be accomplished by facing hogwire, supported and stretched across the stream, with impermeable plastic material providing

a means for releasing water from the lower level of the impoundment. This may be accomplished by punching holes in the plastic or raising the barrier device. Permanent structures such as bridge supports or large culverts provide a base and ideal site for use of this technique. Timber can be used to build a barrier or construct a diversionary canal-and-lock system in conjunction with permanent features selected for potential recovery sites.

When stream flow is low or non-existent at the time of the spill, earth barriers, baled straw or hay with siphoning provisions or valved outlets would be constructed to temporarily close off the spread of oil.

f. Permeable Barriers - When floating brush or heavy debris is present, an open, debris-restricting barrier may have to be constructed. Hogwire, chain link fence, or cable would be utilized and placed ahead of booms and semi-permeable barriers to make them more effective as collecting devices or just protect them from the heavy loading induced by debris buildup. In open water conditions, the protective barrier may have to be floated with barrels or logs since the materials used for providing strength to the system have no buoyancy.

g. Quiet Water Ponds and Oil Reservoirs - Once oil on streams or rivers is diverted or contained, it should be removed from the water surface as soon as possible. This can be done more effectively if the flow rates of underlying water are reduced. Such

a condition may be enhanced by diversion and collection in natural quiet or eddy current areas of the river or stream.

Pot holes or side channels can be constructed at the point of juncture of booms and shorelines using hand tools or construction equipment such as a backhoe. When the buildup of oil cannot be accomplished and skimming or oil pumpoff made effective, a pit or oil-water reservoir can be dug adjacent to the bank to accept oil and water pumped off the main stream. Oil can then be separated and the water bled back into the main stream. In certain instances, especially in the fall, dry stream beds can be dammed off at the point of entry into the mainstream and used as temporary storage basins.

In small streams a diversion canal can be formed with lumber or dug with a backhoe to provide a side working area and quiet water conditions in order to make oil skimming more effective.

h. Collection Devices and Skimmers - The construction of improvised skimming devices is sometimes required because commercial skimmers may not always be adaptable to the conditions. This may occur when oil cannot be collected to thicknesses sufficient for some skimmers to be used effectively in very shallow water or when considerable debris may be present.

Less sophisticated devices are often applicable. Skimmers can be improvised from barrels, simple wooden weir boxes set in the

streambank or perforated pipe arrangements and connected to floating suction lines or pumps. Skimmer inlets can be protected by debris barriers formed from chicken wire or hogwire to exclude debris or absorbents that have been used to retain and collect oil and are not pumpable.

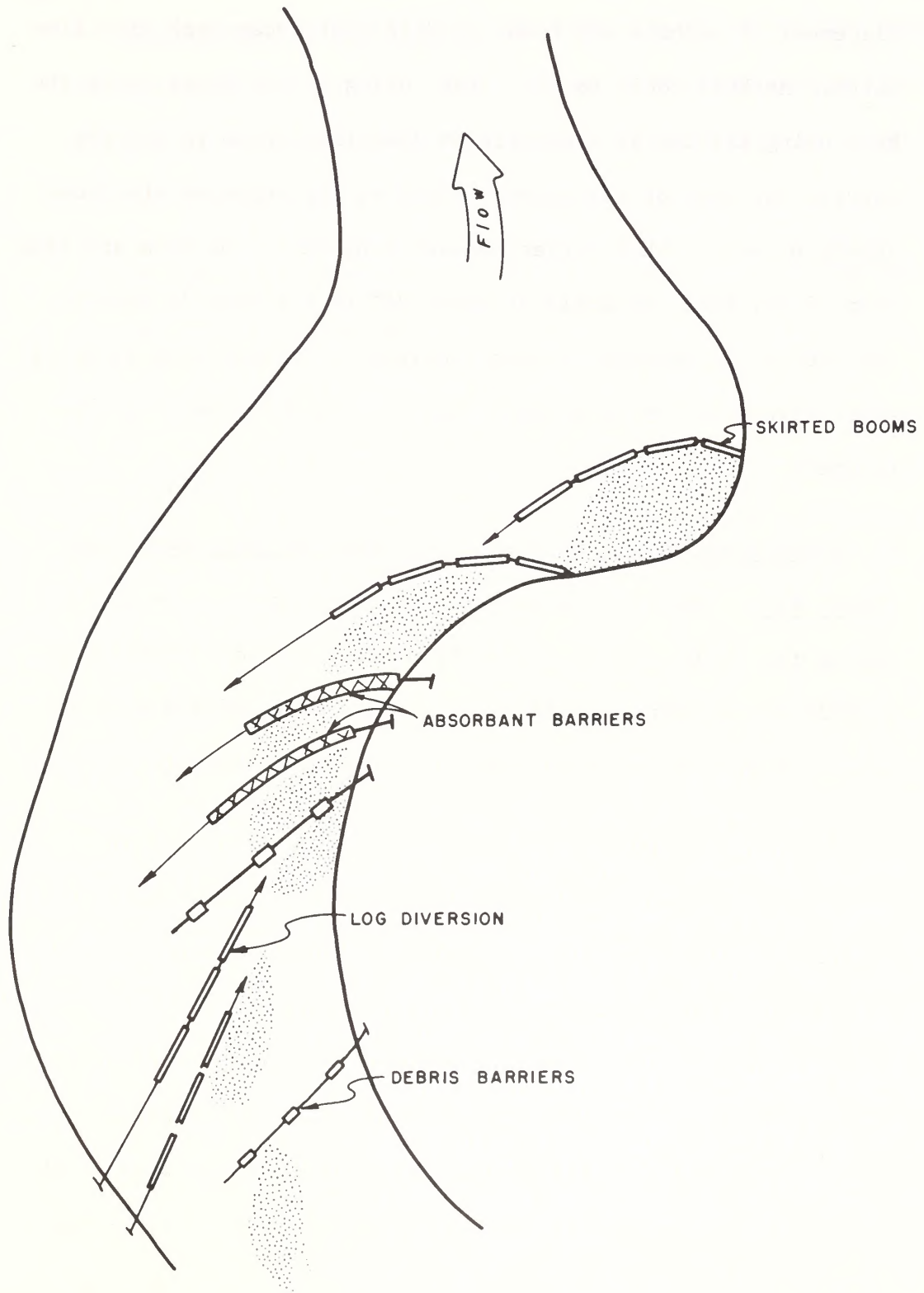
1. Equipment Applications - A survey of the area, along and away from the route that might be subject to exposure to oil from a leak, identified the applicability of equipment and techniques described below.

a. Containment of Oil on the Colorado River - Attempting containment at flow rates of five feet per second dictates that multiple boom placement and diversion techniques be employed. The choice of a working site is also critical to the efficiency of containment at such high average rates.

Figure 10 shows how oil might be diverted to a collection point in quiet water out of the main stream using a combination of boom and barrier types including debris barriers, log booms, semi-permeable diversion booms and containment booms. Ideally, access to both sides of the river by land would be desirable. This may not be possible so oil might have to be channeled from one side of the river or the center to a common collecting point. Wind direction and current patterns are factors in choosing the specific placement of booms.

Since it is not practical to attempt complete bridging of the Colorado in the areas of concern, the upstream end of the booms

Figure 10  
COLLECTION AND CONTAINMENT  
OF DISPERSED OIL ON RIVERS



would have to be anchored from the opposite shore or from a point out in the stream.

Placement of anchors and booms is difficult under such high flow rates. Anchors could be set first, using a line float, with the boom being trailed in a downstream direction so as to use the current for ease of placement. Ideally, the angle of the booms should be set so that current speeds tangent to the boom are less than .7 ft./sec. An angle of about 20° to the bank is usually considered the maximum; however, unless sufficient boom is available, diversion may be accomplished in lieu of attempting containment.

b. Containment of Oil on Roan Creek, Kane Springs, East Salt Creek, Etc. - Many of the streams that carry water year round or during the spring and storm runoff periods exhibit rates of flow from 10 to 20-plus feet per second. This rate coupled with the shallow depths makes containment by barriers difficult.

The depth of a skirt on booms and the junction point at the stream bank tend to develop conditions of even higher rates of flow at the containment points. The alternation of stream flow and bank configuration is likely to be required under high flow rate, shallow water circumstances. Booms and barriers are best placed at an angle even though complete stream bridging is accomplished. Bridges and culverts may be utilized and stream banks can be altered by construction of wooden piers or digging out the bank or stream

bottom. Figure 9 shows some applications of equipment described as field construction methods.

c. Containment in Dry Streams - In the case of dry or low flow stream containment, one of the various field construction applications already described could be employed. Figure 11 gives an example using an earth dam.

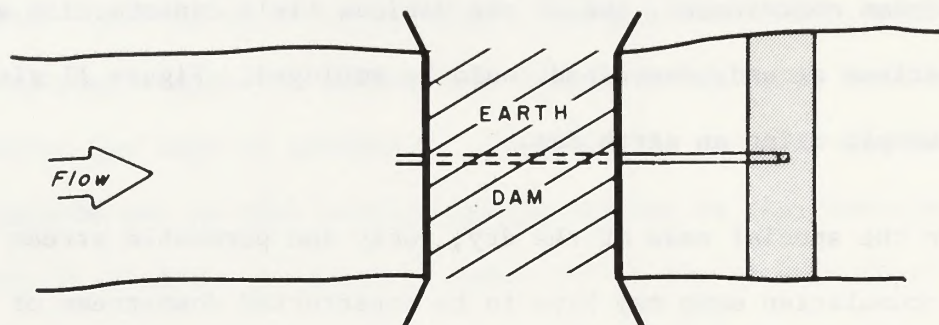
In the special case of the dry, rocky and permeable stream bed, an accumulation sump may have to be constructed downstream of the barrier to insure recovery of subsurface oil seepage.

d. Containment in Dry Land Vegetated Areas - On dry land or in vegetated areas, the use of the baled straw barrier in conjunction with trenching could be used effectively to reduce the spread of oil as shown in Figure 11.

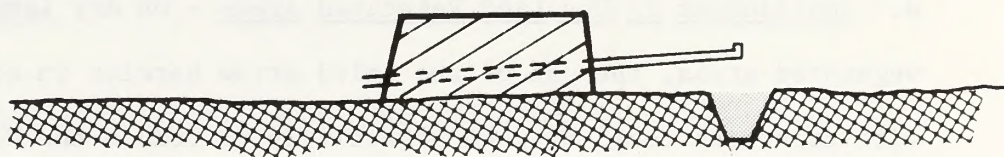
e. Winter Clean-up of Oil on the Colorado River - Clean-up of oil on a major stream such as the Colorado imposes a very difficult task. The icing conditions are such that the river can be covered or partially covered by block ice formed by a breakup, flow and re-freezing sequence. The oil in question has a relatively high pour point or low spreading potential at freezing temperatures. The chunk ice type is itself an asset as a barrier; however, working on the river could be extremely dangerous. Use of absorbents is a feasible application to assist in cleanup of oil on ice. Burning of oil on ice can be accomplished with or without

Figure 11

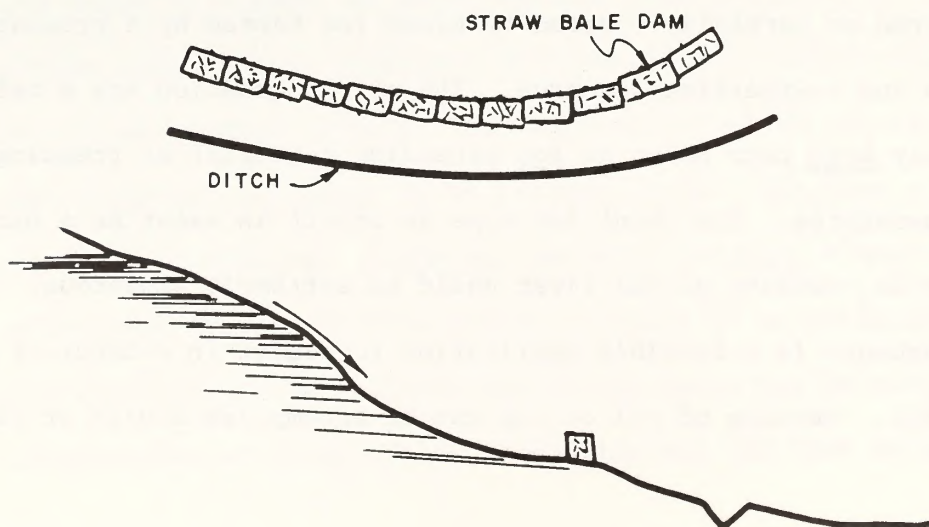
## DRY STREAM BED CONTAINMENT



DRAINAGE PIT



## DRY SURFACE CONTAINMENT



an ignition assist, as from the straw that might be used in in  
containment.

If oil found its way under ice in a quiet water area, a closed  
pond or a reservoir with a smooth ice undersurface, then  
holes cut in the ice with a chain saw may allow the oil to be  
pumped off the underlying water surface.



A P P E N D I X D



Route Response Analysis

This plan covers the area along the pipeline route, the land surfaces adjacent to it and the tributaries and streams making up the drainage system into which any oil spilled from the pipeline system might enter.

Some of the tributaries and washes only occasionally carry water flows while others, such as the Colorado, Kane Springs and East Salt Wash, have continuous flows at the points of pipeline crossing. The following drainage systems are listed as within the scope of coverage of the Plan:

Colorado

1. Colorado River from Grand Valley to Utah Line at Utah Line siding.
2. Parachute Creek
3. Piceance Creek
4. White River from Piceance Creek to Rangely
5. Roan Creek
6. Douglas Creek
7. East Salt Creek
8. West Salt Creek
9. McDonald Creek

Utah

1. Colorado River from Utah-Colorado Line to Moab
2. Bitter Creek
3. Westwater Creek

4. Cottonwood Wash
5. Danish Wash
6. Cisco Wash
7. Nash Wash
8. Pinto Wash
9. Sagers Wash
10. Salt Wash
11. Courthouse Wash
12. Thompson Wash
13. Moab Canyon
14. Colorado River from Moab to Lake Powell
15. Mill Creek
16. Pack Creek
17. Kane Springs
18. Hatch Wash

While not described in detail, response actions apply to all of the land surfaces, main streams and tributaries.

Based upon the information developed by an environmental inventory survey of the route (especially the hydrological data pertaining to stream flows), engineering design features (including valve placement and route selection) and an analysis of practical response capability (as effected by terrain and reaction time) the pipeline route was broken into seven areas for planning response action. The general response planning areas are shown on Figures 12 and 13. These maps would be refined following pipeline construction and made part of the Contingency

Figure 12 RESPONSE PLANNING AREAS 1-3

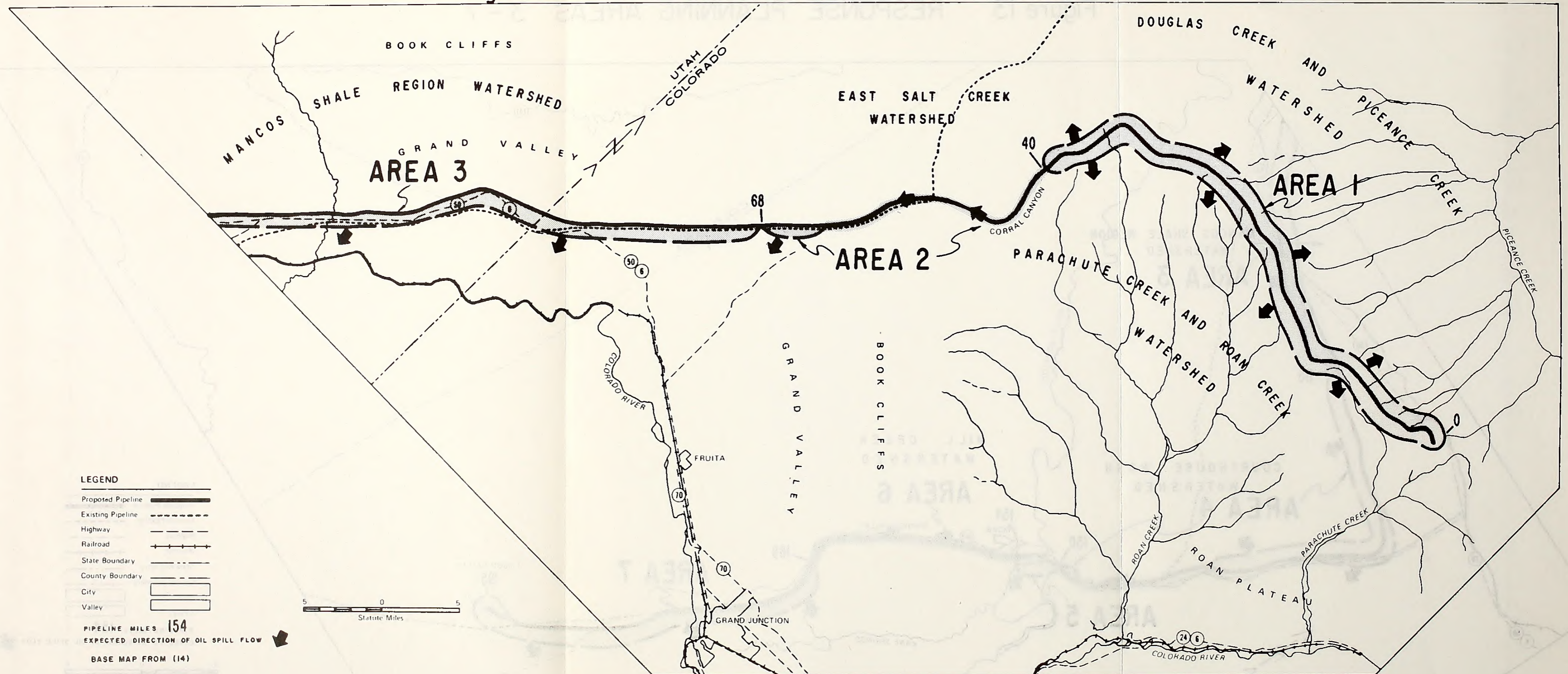
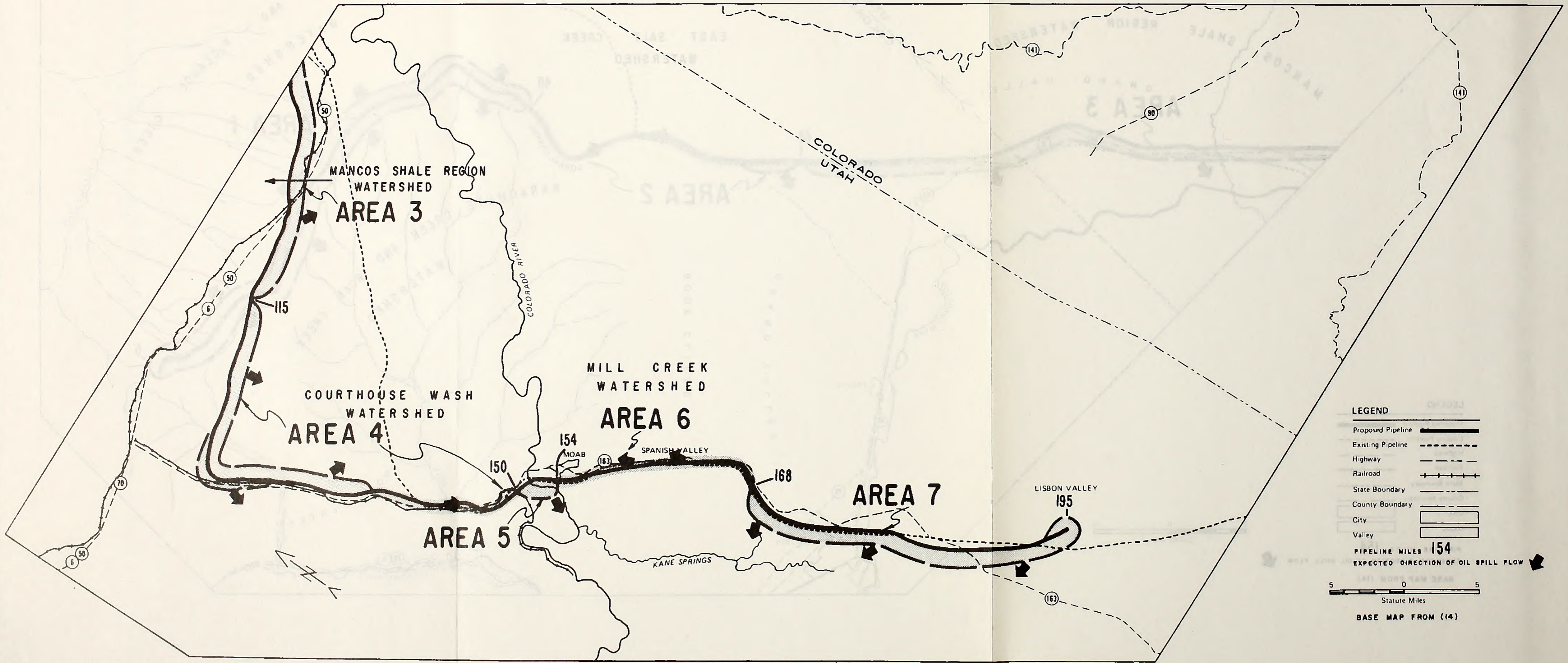


Figure 13 RESPONSE PLANNING AREAS 3-7



Plan map packet.

A brief description of the environmental and response sensitive conditions in each area follows. Generally speaking, the response planning is based upon an area coverage; however, some special locations within an area are identified and specific plans discussed in Appendix E.

1. Area 1 - Pipeline Mile 0 to 40 - This area extends from the plant site and pipeline pump station to a point about where the pipeline drops down off Roan Plateau into Grand Valley.

#### Area Characteristics

The following characteristics of this area require special consideration and must be taken into account in contingency planning:

1. Major watersheds and flowing streams
2. Relatively abundant vegetative cover including trees and feed
3. Wildlife and stock in good numbers
4. Considerable snow cover during winter
5. Natural springs
6. Stock ponds and valley irrigation
7. Seasonal high runoff
8. Some trout and beaver
9. Heavy hunting and some fishing
10. BLM and private lands

#### Accessibility

The lower portions of the main streams can be reached by gravel or paved roads thus providing access to potential recovery sites.

While the pipeline itself will not have a maintenance road, a ridgeline trail road on public lands would provide access to much of the pipeline right-of-way. This access could be closed off in winter due to snow. The plateau route crosses areas that provide landing sites for helicopters which could provide the means of reaching valve locations. The steep ravines off the plateau make access to many areas between the top and ranch areas in the upper valleys difficult. However, private roads to ranch houses are maintained and provide access, if opened to response team use.

#### Surface Conditions and Drainage

The drainage pattern is generally perpendicular to the pipeline route and toward vegetation covered ravines into small headwater streams. After final construction grading, the direction of drainage will be determined as to potential flow of any leaked oil to the north vs. south side of the ridgeline along the route.

#### Design Features

All of the valves in this section of the line must be manually operated. When the valves are closed after location of a leak, oil from outside the now isolated leak area is contained in the line. Valves are located to limit gravity flow from the line after the pumps are shut down and the line has come to static equilibrium. Both valve placement and dips in the line restrict gravity flow. In Area 1, the maximum potential drainage volume was calculated to be about 4700 bbls. (Table 4) The potential backflow regions and valve placement are shown of Figure 15.

TABLE 4  
VALVE PLACEMENT & LINE DRAINAGE VOLUMES

LINE INSIDE DIAMETER = 15.250 IN.

VALVE LOCATION (MILEPOST)	VALVE CLOSURE TIME (HRS. AFTER SHUTDOWN)	ELEV. (FT.)
14.640	-0.00	0
31.288	-0.00	0
53.494	-0.00	0
70.170	-0.00	0
117.519	-0.00	0
133.295	-0.00	0
153.149	-0.00	0
153.622	-9999.00	0
155.906	-0.00	0
161.039	-0.00	0
165.000	-0.00	0
174.413	-0.00	0

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DWNSTRM
0.000	8250		1757	0	1757
.379	8320		1305	0	1305
.985	7660		4712	722	3989
3.371	8360		1143	0	1143
3.598	8240		1810	271	1539
3.958	8370		1110	0	1110
4.205	8230		2284	293	1991
4.328	8310		1970	125	1844
4.943	8370		1110	0	1110
5.095	8305		1484	180	1303
5.331	8400		1021	0	1021
5.672	8250		1792	406	1385
5.928	8390		1107	27	1080
6.250	8250		3105	411	2694
7.263	8315		1719	232	1486
7.453	8360		1369	109	1260
7.879	8445		751	0	751
8.532	8320		2784	779	2004
10.170	8515		50	0	50
10.644	8435		922	564	357
10.795	8490		353	176	176
11.042	8440		899	470	429
11.402	8525		0	0	0
12.515	7650		3019	1328	1691
13.920	8472		95	80	15
14.097	8420		358	290	67
14.148	8480		75	68	6
14.242	8440		328	181	146
14.366	8482		65	65	0
14.631	8380		392	381	11
14.640	8382		375	375	0
14.640	8382	-0.0			
14.640	8382		2436	0	2436
15.038	8470		1961	0	1961
15.284	8335		2561	293	2268
15.511	8460		2018	21	1997
15.720	8360		2621	270	2351
16.269	8280		3560	925	2634
16.922	8500		1855	0	1855
17.235	8410		2390	372	2018
17.424	8535		1792	0	1792
17.595	8395		2518	203	2314
17.718	8460		2276	108	2167
18.305	8365		3210	809	2401
18.542	8480		2198	79	2118
18.741	8360		2883	317	2566
18.977	8430		2462	178	2284
19.148	8280		2876	382	2494
19.366	8465		2344	109	2234
19.460	8445		2585	222	2362

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLs) -		
			TOTAL	UPSTREAM	DWNSTRM
19.621	8475		2260	89	2170
19.801	8415		3098	304	2794
20.455	8490		2080	65	2014
20.625	8430		2586	268	2317
20.985	8515		1917	29	1888
21.477	8440		2701	616	2085
21.591	8500		2096	146	1949
21.799	8410		2677	395	2282
21.970	8450		2363	284	2078
22.121	8400		2673	465	2208
22.348	8505		2044	107	1936
22.670	8445		3219	491	2727
23.333	8505		2044	107	1936
23.608	8440		2685	434	2250
24.053	8550		1719	0	1719
24.205	8500		2352	180	2171
24.659	8560		1629	0	1629
24.886	8535		2113	271	1842
25.208	8580		1458	0	1458
25.417	8505		1912	248	1663
25.568	8575		1499	16	1483
25.947	8450		2560	468	2092
26.723	8640		1166	0	1166
26.951	8560		1913	271	1642
27.500	8670		987	0	987
27.680	8600		1689	214	1475
28.731	8780		221	0	221
28.854	8710		526	146	379
28.987	8780		221	0	221
29.138	8710		700	180	520
29.460	8800		136	0	136
29.545	8765		293	101	192
29.706	8885		0	0	0
29.981	8800		553	327	225
30.170	8840		173	173	0
31.288	8766		1506	1506	0
31.288	8766	-0.0			
31.288	8766		1418	0	1418
32.367	8695		3027	1287	1740
32.689	8780		1356	0	1356
32.879	8720		1690	225	1464
33.030	8820		1283	0	1283
33.712	8790		2358	813	1544
34.697	8925		370	0	370
35.057	8835		1451	429	1022
35.597	8920		402	23	378
35.795	8830		787	261	526
35.947	8940		345	0	345
36.136	8830		995	225	769
36.686	9000		114	0	114

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLs) -		
			TOTAL	UPSTREAM	DWNSTRM
37.083	8900		914	474	440
37.453	9035		0	0	0
38.144	8910		1253	824	429
38.504	9005		197	197	0
38.958	8930		1237	740	497
39.375	8980		378	378	0
39.612	8900		807	661	146
39.735	8940		519	519	0
40.246	8840		1759	1129	630
40.616	8875		1105	916	189
40.805	8830		1673	1142	530
41.250	8900		763	763	0
41.610	8780		1757	1193	564
41.856	8840		1249	978	271
42.083	8775		2107	1249	858
42.803	8870		871	871	0
43.523	8655		2422	1729	692
43.750	8695		1991	1569	421
44.205	8630		2699	2112	587
44.697	8860		911	911	0
45.265	8710		1701	1588	112
45.360	8740		1453	1453	0
46.402	7665		2695	2695	0
47.348	6810		3825	3825	0
48.295	6390		4954	4954	0
49.242	6200		6084	6084	0
50.189	6085		7213	7213	0
51.136	5990		8343	8343	0
52.083	5890		9473	9473	0
53.030	5800		10602	10602	0
53.494	5765		11156	11156	0
53.494	5765	-0.0			
53.494	5765		0	0	0
53.977	5730		575	575	0
54.924	5660		1705	1705	0
55.871	5580		2835	2835	0
56.818	5505		3964	3964	0
57.765	5430		5094	5094	0
58.712	5335		6223	6223	0
59.659	5230		7353	7353	0
60.606	5150		8672	8482	189
60.795	5130		9025	8708	316
61.061	5180		8059	8059	0
61.288	5120		8917	8330	587
61.515	5160		8465	8149	316
61.818	5080		9284	8511	773
61.875	5130		8991	8285	705
61.913	5070		9256	8330	926
62.159	5150		8827	8194	632
62.689	5170	(D-10)	8104	8104	0

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLs) -		
			TOTAL	UPSTREAM	DWNSTRM
63.163	5085		8782	8669	112
63.258	5120		8436	8436	0
64.394	5070		9924	9792	132
65.341	5050		11641	10921	719
65.833	5070		9924	9792	132
66.074	5000		10673	10079	594
66.572	5090		9249	9249	0
67.140	4910		10085	9927	158
67.273	4950		9777	9777	0
68.182	4870		11433	10861	572
68.352	4890		10959	10590	368
68.561	4860		11456	10838	617
68.769	4890		10959	10590	368
68.826	4880		11132	10658	474
69.224	4925		10115	10115	0
70.133	4808		11245	11200	45
70.170	4826		11026	11026	0
70.170	4826	-0.0			
70.171	4826		467	0	467
70.227	4855		399	0	399
70.360	4835		606	158	448
70.492	4900		290	0	290
70.578	4860		503	101	401
70.644	4895		335	12	322
70.795	4800		1129	193	935
71.780	4715		3002	1368	1634
72.813	4645		5208	2599	2609
73.864	4735		2447	1091	1355
75.000	4945		0	0	0
75.625	4880		1615	745	870
76.136	4900		776	516	260
76.307	4910		458	401	57
76.458	4890		763	582	181
76.563	4910		458	401	57
76.674	4898		728	534	194
76.837	4915		344	344	0
77.083	4840		1029	637	391
77.140	4848		929	606	323
77.273	4820		1210	764	446
77.330	4840		1030	651	378
77.403	4798		1394	739	655
77.462	4810		1299	714	585
77.518	4775		1544	780	763
77.576	4791		1444	750	694
77.629	4768		1680	813	866
77.661	4771		1633	805	828
77.830	4735		1998	1006	992
77.955	4770		1654	810	843
77.992	4773		1597	799	798
78.314	4770	(D-11)	1999	1183	815

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DWNSTRM
78.379	4748		2299	1260	1039
78.479	4752		2165	1246	919
78.553	4700		2491	1334	1156
78.627	4726		2359	1290	1068
78.788	4710		2643	1482	1161
79.271	4810		1299	714	585
79.422	4780		1801	894	907
79.545	4800		1534	774	760
80.114	4779		2829	1452	1377
80.492	4791		1990	1064	925
79.981	4670		3046	454	2591
80.246	4680		2780	505	2275
80.341	4660		3151	618	2532
81.042	4725		2429	732	1697
81.385	4655		3338	1142	2196
81.894	4740		2397	807	1590
81.922	4730		2444	841	1603
81.951	4756		2457	888	1569
82.737	4807		1363	732	631
83.070	4730		2464	1129	1335
83.220	4770		2079	922	1156
83.324	4760		2259	1047	1212
83.394	4775		2025	897	1128
83.428	4770		2144	937	1206
83.949	4810		1299	714	585
84.356	4790		1922	1200	722
84.962	4895		422	422	0
85.227	4862		851	738	112
85.322	4870		662	662	0
86.504	4681		2455	2071	383
86.799	4762		1498	1467	31
86.988	4731		2205	1692	512
87.405	4681		3452	2190	1262
87.500	4690		3249	2100	1149
88.068	4580		5906	2778	3128
88.125	4585		5808	2747	3060
88.172	4552		6710	2803	3906
88.239	4558		6620	2793	3826
88.314	4541		6881	2883	3997
88.352	4546		6809	2857	3952
88.485	4520		7180	3015	4164
88.561	4527		7047	2972	4074
88.608	4511		7192	3029	4162
88.655	4520		7103	2997	4106
89.202	4460		8029	3649	4380
89.508	4540		6908	2893	4015
89.626	4504		7476	3035	4440
89.773	4516		7254	2988	4266
89.809	4509		7370	3031	4339
90.265	4561		6583	2788	3795

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DOWNSTRM
90.309	4553		6697	2840	3857
90.341	4559		6620	2801	3818
90.376	4554		6720	2842	3877
90.455	4562		6570	2786	3783
90.511	4570		6488	2773	3715
91.061	4585		5808	2747	3060
91.182	4570		6254	2892	3362
91.402	4580		5896	2795	3100
91.458	4570		6042	2863	3179
91.591	4590		5738	2716	3021
91.837	4552		6594	3010	3583
92.150	4550		7045	3383	3662
93.466	4510		9280	4953	4326
93.477	4495		9336	4967	4369
93.523	4494		9393	5021	4371
93.570	4514		9111	4796	4315
93.668	4500		9342	4912	4429
93.797	4519		8874	4600	4274
93.858	4500		9178	4672	4506
94.034	4518		8899	4603	4296
94.072	4510		9115	4649	4466
94.697	4545		7300	3579	3720
94.735	4540		7395	3624	3771
94.811	4549		7103	3422	3680
94.943	4540		7351	3580	3771
95.019	4549		7103	3422	3680
95.076	4545		7243	3490	3753
95.152	4550		7045	3383	3662
95.172	4545		7147	3407	3739
95.237	4550		7045	3383	3662
95.303	4552		6594	3010	3583
96.023	4610		5318	2593	2725
96.476	4565		7062	3133	3928
96.581	4571		6864	3061	3802
96.875	4552		7489	3411	4077
97.008	4560		7184	3264	3919
97.198	4519		7760	3491	4268
97.405	4550		7341	3319	4021
97.462	4547		7510	3387	4122
97.547	4550		7341	3319	4021
97.642	4545		7601	3432	4168
97.765	4550		7341	3319	4021
97.902	4496		7906	3483	4422
98.239	4550		7341	3319	4021
98.428	4490		8026	3545	4480
98.447	4498		7973	3515	4458
98.462	4482		8094	3534	4560
98.485	4489		8059	3526	4533
98.561	4485		8181	3616	4564
98.627	4495		8004	3519	4485

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DWNSTRM
98.709	4480		8269	3616	4652
98.769	4482		8184	3603	4580
98.882	4470		8397	3738	4659
98.996	4491		8067	3545	4522
99.053	4480		8212	3613	4599
99.110	4490		8082	3551	4531
99.176	4487		8188	3629	4558
99.360	4511		7805	3466	4339
99.443	4490		8017	3566	4451
99.458	4498		7961	3528	4433
99.732	4437		8680	3855	4824
99.754	4442		8627	3828	4799
99.773	4434		8708	3850	4857
99.858	4448		8552	3796	4755
99.935	4430		8753	3887	4865
100.114	4465		8357	3705	4652
100.155	4458		8450	3754	4696
100.341	4493		8029	3555	4474
100.369	4490		8088	3589	4499
100.474	4505		7870	3495	4375
100.559	4472		8118	3597	4521
100.682	4505		7870	3495	4375
100.755	4500		7988	3582	4405
100.871	4523		7688	3421	4267
100.900	4520		7756	3455	4300
100.947	4525		7658	3414	4244
100.981	4521		7727	3454	4273
101.023	4528		7625	3402	4222
101.661	4452		9130	4164	4966
101.847	4480		8628	3883	4745
101.894	4475		8730	3940	4790
101.985	4487		8495	3813	4682
102.316	4440		9322	4208	5114
102.386	4450		9154	4124	5030
102.669	4410		9786	4461	5325
102.775	4430		9491	4292	5198
102.811	4421		9611	4336	5274
103.030	4452		9120	4107	5013
103.494	4380		10358	4660	5698
103.570	4385		10230	4622	5607
103.674	4378		10419	4746	5672
103.712	4380		10338	4711	5627
103.752	4360		10465	4758	5707
103.835	4385		10230	4622	5607
103.866	4383		10280	4658	5622
104.167	4433		9516	4253	5263
104.238	4430		9643	4338	5305
104.451	4448		9189	4138	5051
104.768	4404		9966	4516	5449
104.943	4428		9550	4310	5240

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DWNSTRM
105.000	4415		9741	4377	5363
105.833	4520		7852	3482	4369
105.928	4514		8075	3595	4479
106.174	4530		7581	3395	4186
107.031	4420		9481	4416	5064
107.500	4491		8262	3757	4504
107.547	4480		8405	3813	4591
107.614	4490		8274	3762	4511
107.784	4482		8511	3965	4545
107.813	4490		8274	3762	4511
107.924	4460		8534	3895	4638
108.030	4490		8274	3762	4511
108.144	4481		8473	3898	4575
108.314	4510		7952	3581	4371
108.362	4504		8088	3637	4450
108.428	4510		7952	3581	4371
108.571	4478		8348	3751	4596
108.674	4498		8118	3644	4473
108.703	4491		8191	3678	4513
108.769	4505		8041	3607	4434
108.826	4489		8317	3675	4641
109.044	4509		7968	3586	4382
109.106	4501		8126	3661	4464
109.271	4520		7756	3488	4268
109.309	4515		7843	3533	4309
109.564	4552		7313	3308	4004
109.678	4512		7827	3444	4382
109.754	4518		7716	3424	4292
109.886	4496		8161	3582	4579
109.915	4500		8099	3553	4545
110.133	4475		9036	3813	5223
110.341	4481		8725	3750	4974
110.417	4477		8906	3841	5065
110.871	4501		8069	3546	4523
110.909	4495		8172	3591	4581
110.966	4502		8052	3539	4513
111.061	4492		8299	3652	4646
111.108	4500		8152	3561	4590
111.193	4490		8639	3663	4975
111.710	4506		7869	3510	4359
111.724	4510		7824	3481	4343
111.771	4495		7977	3538	4439
111.932	4525		7647	3400	4247
111.960	4516		7760	3434	4325
111.974	4520		7728	3419	4308
112.169	4496		8254	3650	4603
112.519	4530		7569	3383	4186
112.558	4524		7626	3429	4196
112.576	4536		7538	3363	4175
113.049	4589		6456	2845	3610

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLs) -		
			TOTAL	UPSTRFAM	DWNSTRM
113.341	4570		7133	3193	3940
113.617	4589		6456	2845	3610
113.839	4580		7099	3109	3989
115.606	4630		4352	2470	1881
115.635	4627		4422	2504	1918
115.758	4639		4186	2414	1771
115.777	4636		4231	2437	1794
115.833	4645		4104	2377	1726
115.881	4640		4195	2434	1760
115.938	4650		4039	2347	1692
115.985	4649		4112	2403	1708
116.364	4678		3431	2174	1256
116.383	4674		3476	2197	1279
116.439	4686		3336	2125	1211
116.477	4684		3412	2170	1242
117.519	4764		1452	1452	0
117.519	4764	-0.0			
117.519	4764		6212	0	6212
118.845	4820		4631	0	4631
121.212	4840		1807	0	1807
122.727	4880		0	0	0
124.621	4775		2259	2259	0
126.515	4715		4518	4518	0
128.788	4650		7263	7229	34
130.110	4600		8889	8806	83
130.180	4685		5769	5769	0
130.398	4610		7271	6029	1242
130.871	4650		6568	5890	677
131.534	4605		8782	6681	2100
133.295	4671		5816	5816	0
133.295	4671	-0.0			
133.296	4671		1626	0	1626
133.523	4680		1355	0	1355
134.659	4745		0	0	0
137.311	4580		4333	3162	1170
139.205	4510		7409	5421	1987
139.773	4500		8200	6099	2100
140.152	4540		6102	4453	1649
140.625	4470		7413	5018	2394
141.250	4540		6102	4453	1649
142.992	4410		9735	6532	3203
144.697	4580		4333	3162	1170
145.549	4480		6222	4179	2043
146.117	4570		4630	3264	1365
146.269	4530		5591	3445	2146
148.068	4640		2012	2012	0
148.599	4370		3137	2645	492
148.864	4420		2703	2528	175
150.492	4220		5364	4470	893
150.947	4320	(D-16)	3851	3499	351

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DOWNSTREAM
151.136	4240		4217	3725	492
151.549	4520		2293	2293	0
153.149	4046		4202	4202	0
153.149	4046	-0.0			
153.150	4046		0	0	0
153.409	3970		309	309	0
153.622	3968		563	563	0
153.622	3968	-9999.0			
153.622	3968		1853	563	1290
154.735	3960		3288	1890	1397
155.906	4069		0	0	0
155.906	4069	-0.0			
155.907	4069		4529	0	4529
157.197	4190		2989	0	2989
159.091	4530		730	0	730
159.280	4580		504	0	504
159.659	4500		2097	451	1646
161.039	4615		0	0	0
161.039	4615	-0.0			
161.039	4615		4724	0	4724
161.932	4690		3659	0	3659
163.826	4825		1400	0	1400
165.000	4945		0	0	0
165.000	4945	-0.0			
165.000	4945		4258	0	4258
165.720	5020		3399	0	3399
166.667	5170		2270	0	2270
168.513	5530		67	0	67
169.205	5495		982	824	158
169.280	5530		67	0	67
170.265	5380		1445	1174	271
170.492	5580		0	0	0
171.212	5125		2555	858	1697
171.307	5160		2376	792	1584
171.354	5110		2565	848	1716
171.487	5170		2331	773	1558
171.951	5000		3622	1327	2295
172.462	5140		2556	871	1685
172.680	5050		3198	1131	2066
174.413	5537		80	80	0
174.413	5537	-0.0			
174.413	5537		3596	0	3596
174.564	5580		3415	0	3415
176.610	5910		975	0	975
177.727	5790		2959	1332	1626
179.091	6090		0	0	0
181.894	5820		4837	3343	1494
182.443	5930		2820	1981	838
184.546	5720		7678	4488	3189
186.610	5940	(D-17)	2584	1857	727

TABLE 4 (continued)

## DRAINAGE VOLUMES FOR FULL LINE RUPTURE

RUPTURE MILEPOST	ELEV. (FT.)	VALVE CL. TIME (HRS)	- DRAINAGE VOLUME (BBLS) -		
			TOTAL	UPSTREAM	DWNSTRM
187.576	5790		4884	3009	1875
189.148	6035		681	681	0
189.883	5880		4082	1557	2524
191.999	5980		992	992	0

## DRAINAGE VOLUME DISTRIBUTION

VOLUME RANGE (BBLS)	LENGTH EXPOSED (MILES)	PERCENT EXPOSED
0 - 2000	62.232	32.413
2000 - 4000	55.005	28.648
4000 - 6000	21.460	11.177
6000 - 8000	25.615	13.341
8000 - 10000	22.425	11.680
10000 - 12000	6.284	3.273

MAXIMUM DRAINAGE = 11641 BBLS.

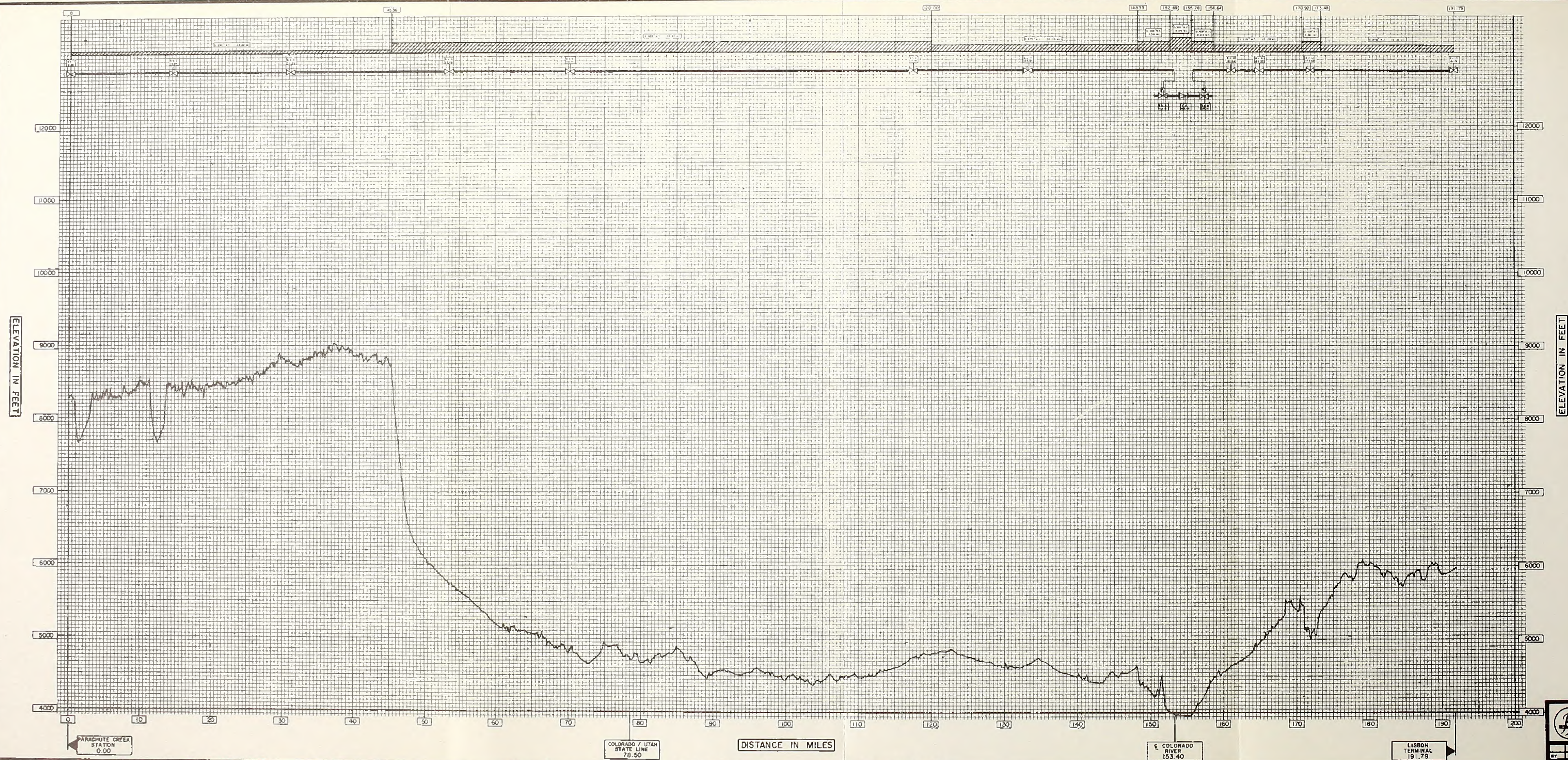


Figure 15  
LINE PROFILE AND  
VALVE PLACEMENT

<b>PIPE LINE TECHNOLOGISTS, INC.</b> P. O. BOX 1118 • MOOREHEAD, TEXAS 79057				<b>ARCO PIPE LINE COMPANY</b> SYNTHETIC CRUDE PIPELINE	
BY: <b>R. BULLS</b> DATE: DEC 11, 1973	DRAWN: <input type="checkbox"/>	CHECKED: <input type="checkbox"/>	CHECKED: <input type="checkbox"/>	APPROVED: <input type="checkbox"/>	SCALE: <input type="checkbox"/>
AS NOTED				PROJECT NO.: <b>830</b>	DRAWING NUMBER: <b>15-</b>



### Oil Recovery Locations

In this section of the line no streams are crossed; however, oil from a spill could enter the headwater areas of four major stream systems flowing to the Colorado or White rivers. These major streams are the Parachute, Roan, Piceance and Douglas Creeks.

Portions of these major watersheds can be expected to carry some water during most of the year. Under certain conditions it would be possible for some oil from a major or medium sized spill to reach a headwater stream and be carried into the mainstreams.

While the headwaters are generally within a mile of the pipeline, the distance of entry into the Colorado varies from about 20 to 35 miles. Most of the spill recovery points shown on Figure 14 were chosen to allow interception of any oil prior to its entry into the Colorado or the White rivers. A primary recovery center has been chosen on each mainstream at locations favorable to containment and recovery operations while allowing a one to three hour time for on-scene arrival from either Rangely, Grand Valley or the Plant operating control centers. Additional locations have been identified upstream and downstream from the primary recovery center to allow adjustment to response reaction times, varied spill volumes and other conditions which might affect containment and recovery action. These have been designated as advance containment or backup recovery sites.

When possible, the most advanced points would be utilized in order to minimize the extent of exposure. It is likely that under the







fast water conditions which could be encountered, that a backup location would be necessary. The primary recovery centers are considered as those single points at which the maximum recovery of oil entering these waters is possible.

When oil from a spill does not enter a flowing stream system, the area would be reached either from the water shed bottoms, from the ridgeline trail or by helicopter depending upon the ease of access and response time requirements.

Essentially the full range of containment and clean-up procedures are applicable to this designated response area; however, specific applications pertinent to this area were discussed in Appendix C, 2-a and are covered in an example location in Appendix E. These are concerned with oil recovery in the headwater area of small streams.

2. Area 2 - Pipeline Mile 40 to 68 - This section of the route starts at about a point where the pipeline enters the East Salt Fork Creek Drainage system and covers the area where the route runs parallel to and close by the creek until it leaves this drainage system at Dry Canyon Wash.

#### Area Characteristics

The main factors in this area pertinent to response planning actions and recovery effectiveness are:

1. Close proximity of the pipeline to East Salt Creek
2. Use of natural flow waters for irrigation

3. The presence of stock ponds and cattle grazing
4. Some trout and possibly beaver in the streams
5. Private and public land ownership
6. The proximity of ranches and private water supplies
7. Natural springs and water recharge systems in the area
8. Some fishing and hunting activity
9. The isolation of Salt Creek drainage from the Highline irrigation system
10. The potential for landslides

#### Accessibility

This section of the pipeline right-of-way and most off-route areas have good access to any location for which response to a leak might be required. A paved highway, No. 139, provides a quick and essentially year-round route to much of this segment of the pipeline. Private and public offroads give good coverage to potential response areas; namely, Mitchell Road provides access to the west off Highway 139, 10 Mile Road to the north off Highway 6 and paved or gravel roads off Highway 139 into the head area of Corral Canyon.

Reaction time is critical in this area because of the close proximity to East Salt Creek and ranches along it. Since private access may be somewhat restricted, prior arrangements are necessary to insure entry.

### Surface Conditions and Drainage

Drainage away from the pipeline would be into the East Salt Fork Creek system which runs parallel in close proximity to the route for over 10 miles. The bottoms of much of the East Salt Fork drainage system are covered with vegetation and utilized for ranching. The area west of Highway 139 is more arid and any drainage would be into dry stream beds except during run-off periods.

### Design Features

Several small stream crossings will be made in this section of the pipeline. They will not be isolated by valves, but the line will be buried to a depth that insures the same physical protection as areas adjacent to such crossings. This area of the pipeline is to be well marked because of a higher concentration of activity and access by outsiders to the right-of-way of the buried pipeline.

The rapid decrease of elevation from plateau to valley floor in a potential landslide area makes the section of the line from MP 45 to 55 significant as to gravity drainage of oil subsequent to a leak. Attention was given to route selection and engineering design to prevent damage from landslides and to valve placement to minimize any release of oil just in case a failure occurred. Closing the block valves can limit the maximum gravity flow to 12,000 bbls. As reflected in Figure 15 the closing of the block valve (BV 4)\*upstream of a leak at MP 55 restricts the volume that can flow from the

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\* BV -- Block Valve; MP -- Pipeline Mileposts

higher elevation section of pipeline above the valve. The oil below the leak at a lower elevation of the pipeline is physically contained in the line.

#### Oil Recovery Locations

Because of the close proximity to East Salt Fork Creek, a line break in the area could very well release oil into this stream which flows at variable volumes and rates during much of the year.

Recovery of oil and clean-up in the section of the line east of Highway 139 is planned in the initial response activities and will be conducted on a continuous basis due to the ranching use in this area. However, because of the short distance and minimum lead time available to prevent flow of oil into even more populated areas and eventually possibly even into the Colorado, the primary recovery centers are anticipated at points shown on Figure 14. These points located further down East Salt Creek toward the point of entry into the Colorado allow one to two hours lead time for response action under a maximum flow rate condition.

The particularly good access to most areas which might be affected by a spill provides a number of additional recovery site alternatives in this area. The bridges on roads crossing the stream can be utilized as recovery points as described previously.

The pipeline right-of-way is removed from the agricultural area to the south which is crossed by numerous irrigation systems and particularly the Bureau of Reclamation Highline Canal. The East Salt Creek flows through this area, but not into the supply

canals. This isolation from the main irrigation system all but eliminates the possibility of any oil migrating into the Highline System. The creek, however, is used for irrigation by individuals above this area. A plot layout of the Highline irrigation system is included as Figure 16.

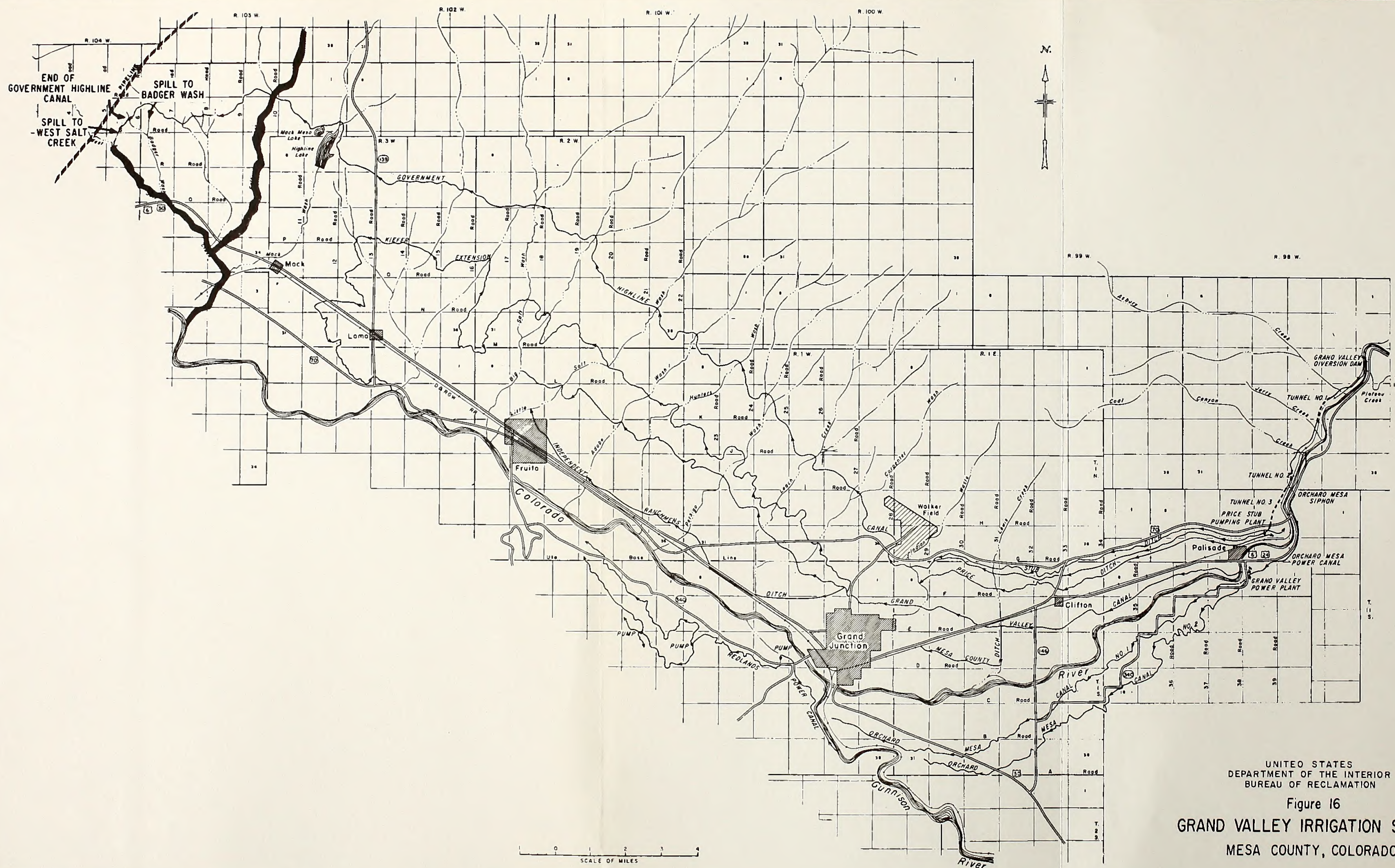
3. Area 3 - Pipeline Mile 68 to 115 - This section of the pipeline route travels across the Grand Valley in Colorado and Utah over what may be described as the Mancos Shale Region. It crosses several dry or intermittently flowing major drainage systems including West Salt Creek Wash to the east and Sagers Wash to the west as shown on Figure 14.

#### Area Characteristics

Certain terrain, right-of-way location and environmental factors that are taken into consideration in the response plan are:

1. The semi-arid nature of the land, the vegetation present and the drainage system conditions.
2. Close proximity to the intercept of the main drainage washes and the Colorado River
3. High flow rates in streams during periods of runoff
4. Some grazing and mining
5. Government controlled and private lands
6. A corridor for the interstate and other roads, railroad and gas pipeline
7. Sparsely settled but significant oil and gas exploration activities.







## 8. Potential erosion of stream bottoms

### Accessibility

This section of the route has good accessibility to the right-of-way and generally good entry into areas of potential leaked oil runoff or land surface coverage. The generally flat open terrain can be crossed during dry periods and gravel and dirt ranch roads provide entry to areas adjacent to some of the main washes that might intercept any oil runoff from a leak.

The location of Highway Interstate 70 and remaining portions of Highway 6 provide not only almost year round but a means of high speed access to this section of the route either from Grand Junction or Moab. The distance between these response centers, the location of a leak and the relatively short distance to the Colorado River tend to offset the advantages of easy access during spring runoff periods. Highway 128 and ranch roads do provide access to the Colorado at some points.

### Surface Condition and Drainage

During much of the year, this area will be dry. Under dry land conditions, oil will be absorbed by or into land surfaces and in the drainage bottoms thus diminishing the spread of any oil from a pipeline leak. Vegetative cover in this area is not a significant factor to retainment of the spread of oil; but, because of the potentially slow recovery, special consideration will be given as to methods of cleanup of spills on dry soils.

When the streams contain water, they generally would be flowing at a high rate; and their discharge is into the Colorado River less than 10 miles away.

For about 40 miles of this 50-mile section of the route, the pipeline lies north of Highway 70 and the railroad, both of which provide barriers to the general southernly drainage to the Colorado except at major wash crossings. Whenever possible, such crossings would be used in supporting barriers to flow.

#### Design Features

A large number of wash crossings will be made in this pipeline section, but none of them will require or have isolating valves on either side of the crossing. Gravity drainage from a leak in this section is not as large a factor as in some of the other sections of the route; however, block valves will be placed to limit the potential afterflow to 12,000 bbls. maximum. Cathodic protection facilities will be installed as required; and in view of the off-road oil and gas activity, the route will be clearly marked.

#### Oil Recovery Locations

Considerable attention has been given to the presence of stream crossings and response actions to oil entering flowing streams in this Contingency Plan. This is not because failures are expected or generally occur in, under or adjacent to either dry or flowing streams. It is the necessity for a planned contingency

reaction for quick and effective response actions to any spill that might occur, that centers attention on potential oil recovery locations and not the expectancy of occurrence. As an example, in this 50-mile section, some 35 to 50 dry drainage washes would be traversed, of which about 10 could be considered major, and one or two carry water over a good part of a wet year. This makes only about 1% of this section susceptible to a direct entry into a drainage over a very small period of each year. The recovery of oil leaked from this pipeline would therefore probably be a dry land cleanup within a short distance from the point of leak.

Planned recovery points for the unexpected, or entry into a flowing drainage system are shown on Figure 14. Locations have been noted where the major washes cross the main highway or the railroad. Methods of containment and recovery at such locations have previously been discussed.

A major spill primary recovery point has been located on the Colorado at a point of good access from either Moab or Grand Junction and a backup point noted on the Colorado upstream of the Moab area. Under the climatic conditions causing high flow rates in the generally dry streams, response time is critical and the primary recovery point and backup location anticipates both difficult recovery operations and the necessity for their location at an adequate distance away from the pipeline to allow time for interception of the oil.

4. Area 4 - Pipeline Mile 115 to 150 - The section to be described as a general response area lies generally above and adjacent to Arches National Park. It includes those drainage systems from Salt Wash to the west and around the route to the south of the wash through Moab Canyon.

#### Area Characteristics

While much of this area is similar to the terrain and climatology found in Area 3 and Area 7, certain off-route features enter into response planning.

1. Drainage routes into Arches National Park
2. Close proximity of the pipeline to the railroad and Highway 160
3. The scenic attraction along parts of the route, especially Moab Canyon
4. BLM, U. S. Parks and state and private land supervision
5. Potable underground water sources and surface recharge systems
6. Some cattle grazing and hunting
7. Potential erosion of stream beds

#### Accessibility

Since the surface soils and drainage bottoms are dry much of the time in this area, any oil leaked from the pipeline could be contained by terrain and surface characteristics along the right-of-way. Good access to the right-of-way is provided by the close proximity of the route to the major highways, and critical off-route areas that would need to be reached in the event of a spill have

routes of access either overland or by present roads and trails in the area. Recovery sites with good access to points along the possible avenues of oil spread away from the pipeline have been located as shown on Figure 14.

#### Surface Conditions and Drainage

This area basically has a high desert climate, terrain and vegetative cover. In some areas a few miles from the right-of-way the streams, particularly Courthouse Wash and Salt Creek do carry some water much of the year from springs or seeps.

The character of most of the land surface adjacent to the pipeline route, including wash and drainage bottoms, is such that oil spread would be limited and absorbed by the soils and wash deposits. The Moab Canyon Wash does offer additional restraint to oil spreading in that it contains rocks and boulders and very unconsolidated bottom deposition. The flatter desert-like terrain above Arches has low relief and many natural entrapment areas.

#### Design Features

In addition to block valves located to restrict afterflow due to gravity head, cathodic protection and marking of the underground pipeline location, the last few miles of the section of the pipeline starting near the exit of Moab Canyon will be constructed with extra wall thickness pipe as shown along with the profile of the line in Figure 15.

### Oil Recovery Locations

Most of the area adjacent to the route has characteristics which would contain or absorb oil from a leak; however sites have been located on Salt Creek, Courthouse Wash and in Moab Canyon for pre-planned response to the exceptional situation that might allow oil to be carried into Arches Park by these stream routes. The recovery sites chosen have ready access and manmade structures which can be utilized in recovery operations.

It is possible but not probable that oil would ever reach these points within the park, but in the event of a leak occurrence during a period of high runoff they provide a point for oil recovery ahead of the carrying stream's flow into the Colorado.

The pipeline does cross both Courthouse Wash and the Moab Canyon Wash; and although not specifically shown on Figure 14, these locations are noted as potential dry wash recovery sites in Appendix E.

5. Area 5 - Pipeline Mile 150 to 154 - A relatively short section of the pipeline in the area of the Colorado River Crossing has been designated as a separate response planning area. This section starts at the exit of the pipeline from Moab Canyon at about the Arches Park Headquarters and extends just beyond the right-of-way intercept with Mill Creek above its point of entry into the Colorado. It includes the Colorado River Crossing.

### Area Characteristics

The following characteristics of this area require special response planning attention.

1. The pipeline crossing under the Colorado River
2. The passage through Moab Canyon Wash and the crossing of Courthouse Wash, Mill Creek and the Colorado River
3. The tourist activity at the Colorado
4. The potash plant operation downstream
5. Crossing of the swamp area
6. Private, state and federal land ownership
7. Irrigation along the East bank of the Colorado downstream of the river crossing
8. The possibility of flow into Canyonland Park and Lake Powell

### Accessibility

The pipeline and right-of-way have avenues of immediate access in this area except for the section under the Colorado and in the adjacent swamp area to the south. Once oil enters the Colorado River, access to containment sites is restrictive to vehicular traffic except for the first five miles downstream on the south side and the first 17 miles downstream by Route 279 on the north side of the river to just below the Potash plant location.

A route down to the Colorado River downstream of Potash is provided by a narrow four-wheel vehicle road to a point where Lathrop Canyon intercepts the river. The trail ends on the northwest side of the river some 40 river miles downstream. There

also is a seldom used and difficult passage trail down into Lockhart Canyon on the east side some 37 river miles downstream. The latter provides a possible route to a potential recovery point when response reaction time is not a significant factor. The only other road access to the Colorado River above Lake Powell proper is by way of Highway 95 to Hite Crossing.

Containment and recovery locations along the bank of the river, such as the primary recovery location chosen near Lathrop Canyon, can be reached and supplied by helicopter. Jet boats or other modes of water transport provide a means of access to points downstream of the river crossing by water.

#### Surface Conditions and Drainage

Except for a limited area just south of Moab Canyon, we are dealing with a situation where anything greater than a small spill would likely drain into the Colorado; and, of course, a leak in the section under the river would directly enter into the Colorado.

The swamp area on the south side of the Colorado is flat and marshy providing a slow but likely avenue of drainage into the Colorado of some portion of a spill of major proportion.

This is a critical area for a spill occurrence; however, there is fortunately no greater chance of occurrence in this section than in other sections of the pipeline. As will be discussed, special design features are to be applied.

### Design Features

DOT regulations require certain special design features be incorporated at river crossings in regards to valves and depth of burial. Across the river extra heavy wall thickness pipe will be installed as an added safety factor (.500 W.T. X 52) and a heavier protective coating thickness will be applied for corrosion protection. A concrete coating provides the holdown required to maintain line position under long term conditions.

In addition to compliance with the valve placement requirements, the valves are to be capable of being closed remotely from the Operations Control Center or Plant Site Pumping Station upon alarm by a system indicating a loss of pressure or abnormal change of rate along the line. The remotely operated block valves would be located on the north side of the river on the higher dry ground above the marsh area south of Mill Creek. A check valve will be placed in-between the block valves as shown on Figure 15. This check valve will prevent backflow toward the river in case of a leak occurring at a point of lower elevation. The section of the pipeline under the river, to be isolated by this valve placement design, will contain about 600 bbls. of oil that is subject to a low gravity head flow potential.

### Oil Recovery Locations

There is little more reason to expect a leak and resulting spill situation in this section of the line than in any other section, especially since extra measures of prevention of leaks will be

incorporated into the design for the river crossing. The only factor that can be associated with the causes for leaks is the outside activity in this area of the pipeline right-of-way. However, should a spill occur, containment, recovery and cleanup of spilled oil would be accomplished under relatively difficult conditions.

Response time is critical due to the close proximity of the right-of-way to the Colorado River and to the width, rate of flow and difficulty of access to the river itself beyond a distance of 17 miles downstream from the pipeline crossing.

As shown on Figure 14 advance recovery locations have been anticipated just upstream of the entry of small streams into the Colorado; however, the primary recovery center is located just downstream of the potash plant at the Potash boat landing or between river miles 48 and 49 on Figure 17.

A second primary recovery point has to be considered due to short response time at high rates of river flow. This point was located between Lockhart Canyon and Lathrop Canyon or at about river mile 25 as shown on Figure 17. Details concerning these recovery points are covered separately in the following Appendix on Specific Spill Recovery Sites. Consistent with the approach to always anticipate a backup point to the primary recovery locations, Spanish Bottoms has been noted as such a potential site. Access to this point is noted to be very limited and

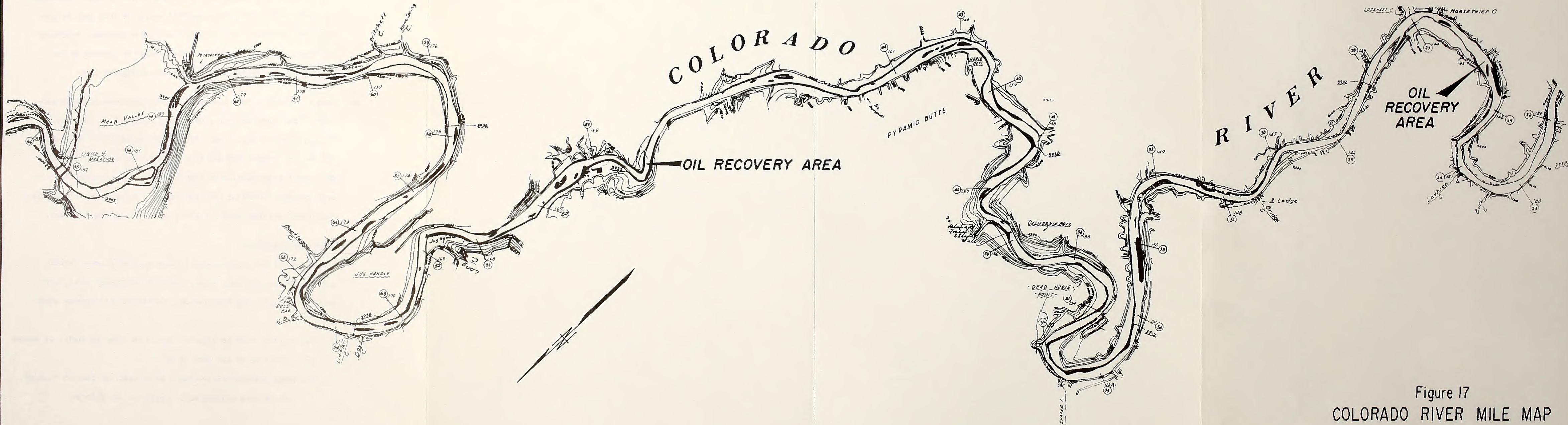


Figure 17  
COLORADO RIVER MILE MAP

difficult, and it is realistically only a last chance point before the Cataracts Canyon section of the Colorado.

Logistics of supply are critical to the response planning for the recovery sites chosen for all areas of the pipeline. However, the ready availability and continued supply in this area is particularly critical. The stockpile point for equipment necessary to respond quickly to a spill would ideally be located in the vicinity of the Potash plant at the end of Highway 279.

6. Area 6 - Pipeline Mile 154 to 168 - This area includes that section of the pipeline from a point just south of the intercept of the pipeline and Mill Creek, through the outskirts of Moab and to the west of Highway 160 and Pack Creek to the bridge crossing of the normally dry section of Kane Springs. This section covers an area somewhat different than the adjacent areas or the other areas designated and described for spill response planning purposes.

#### Area Characteristics

While much of the right-of-way in this section is over terrain similar to the arid semi-desert features previously noted, certain of the following features are significant to response planning.

1. The pipeline will be adjacent to and in close proximity to houses and facilities of the town of Moab
2. The route parallels Pack Creek, whose route of flow is through the town of Moab joining Mill Creek near the Colorado

3. The pipeline will be layed adjacent to irrigated farm land in the Spanish Valley area
4. Private, state and federal lands ownership and supervision in the area
5. The presence of a water well supplied irrigation system along Pack Creek drainage

#### Accessibility

Easy and quick access is provided to this section of the pipeline by the city roads of Moab and Highway 160 south from Moab. Areas that might be subject to exposure to an oil spill can be reached by off-road routes or paved and dirt road systems through Spanish Valley.

#### Surface Conditions and Drainage

This section of the pipeline lies above a part of the housing and commercial development on the south outskirts of Moab. The drainage in the first two miles above the townsite is broken up by this semi-urban development. Such a pattern of surface use and direction of drainage does point to the need for special concerns for safety and possibilities of public exposure to oil leaks.

The pipeline route lies southwest of the present gas pipeline and Highway 160. Both provide some restriction to drainage due to present drainage diversion systems along the highway route. Pack Creek is dry for much of the year above the portion that passes through the Spanish Valley and carries runoff and shallow groundwater. Drainage into the main Pack Creek bottom is controlled

by culverts under Highway 160.

The more southerly part of this area crosses a desertlike rocky terrain, dry side branches of the Pack Creek drainage system and includes the normally dry portion of upper Kane Springs drainage system.

#### Design Features

Special attention will be given to right-of-way marking in the townsite area, the placement of block valves and for about the first two miles of this pipeline section a heavier wall thickness pipe will be used as an extra preventative design measure.

#### Oil Recovery Locations

The easy access to the right-of-way and the dry land nature of much of this spill response planning area makes any point on the pipeline a possible response point; however, each of the culverts and bridges along Highway 160 provides a potential isolation and recovery point for any oil which might escape the right-of-way area.

In the event of oil entry into Pack Creek at a time that it was carrying a high volume of runoff, a recovery location is planned on Mill Creek above its entry into the Colorado. A recovery point above the Spanish Valley area may be possible at times of lesser flow rates or when restriction of entry into a drainage system allows a longer reaction time.

7. Area 7 - MP 168 to 192 and the Terminal Area - This response planning

area extends from the Kane Springs Bridge Crossing of Highway 160 to the terminal at Lisbon.

#### Area Characteristics

Certain features along the right-of-way and off the route are considered significant to planning response actions.

1. The crossing of Kane Springs in the area of Hole in the Rock and Kane Springs Park
2. The high water flow rates measured in Hatch Wash and Kane Springs during peak runoff periods
3. The inaccessibility of much of Kane Springs Canyon
4. The traverse of an open sparsely used section of desert-type terrain for most of this pipeline section

#### Accessibility

Most of the pipeline right-of-way can be readily reached by Highway 160 and off-road travel routes. However, Hatch Wash and Kane Springs have limited access to points that could be reached in time to attempt recovery of oil from upper reach sections of fast flowing waters during periods of high runoff. While Kane Springs Canyon does have a good access route to its point of entry into the Colorado and that portion about 5 miles upstream, as well as the Hole in the Rock location to the pipeline crossing area, Kane Springs Canyon in the middle section presently is inaccessible to most logistic supply other than by foot transport.

### Design Features

No outside influences or internal pressure conditions which can be associated with the cause of leaks would indicate a special problem in the pipeline crossing Kane Springs. However, the unique environmental significance of Kane Springs, the difficulty that can be foreseen in the cleanup of any oil leaking into Kane Springs at the pipeline crossing and which might not be flushed through Kane Springs Canyon has prompted the application of special preventative design features at this point on the pipeline.

The pipeline section in the bottom area of Kane Springs Canyon will be of a heavier wall thickness (.406") and double wrapped as an extra corrosion prevention measure. A block valve will be located between the crossing and the Terminal Station (Figure 15) to prevent excessive backflow into the Kane Springs Canyon bottom if a leak should occur in spite of these special design precautions.

### Surface Conditions and Drainage

The desert-like terrain would normally confine the spread of small volumes of leaked oil during conditions of low flow rates in the stream systems. The pipeline crosses the continuous flowing section of Kane Springs below the springs outflow area at Kane Springs Park and traverses a number of side drainage systems into Hatch Wash which joins Kane Springs about 12 miles above where it enters the Colorado River.

Most of the area in this section of the line can be described as

a desert terrain and the spread of oil would normally be confined by natural containment due to soil absorption or topographic features.

The Hatch Wash drainage system does constitute a potential route of dispersion and carry off of water during excessive runoff condition periods, and response to these unusual conditions would be covered by this plan.

Kane Springs, because of its continuous flow above ground for several miles downstream of the pipeline crossing, offers a direct avenue for expanding an oil spill incident. An additional problem is added by the disappearance of surface flow during part of the year in the inaccessible area of Kane Springs Canyon.

#### Oil Spill Recovery Locations

Recovery areas have been pinpointed as shown in Figure 14. The periods of high rate flows in Hatch Wash and Kane Springs have required that primary recovery locations be identified nearer to the entry of Kane Springs into the Colorado than to the headwater areas. This does expose a longer section of the system to exposure to oil; however, such practical considerations regarding logistics and response timing dictate this course of action.

In the event that Hatch Wash or Kane Springs did not flow at a rate high enough to promote flushing, the clean-up action would be conducted along Kane Springs within the rugged canyon area by workers on foot using air-dropped or packed-in tools.

The terminal area is a self-contained recovery location by virtue of the preventative design features employed.

## APPENDIX E



Recovery Site Examples

General containment and clean-up procedures, techniques of equipment employment and resource deployment that have been described are applicable to this pipeline route in total under the various conditions anticipated. In addition, the general and specific locations for response have been noted and discussed by designated response planning areas covering the entire route. This appendix describes various specific recovery sites chosen as random or special examples.

Included as part of this section are photographs of various sites that will help demonstrate the physical nature of potential recovery sites and suggest approaches to oil spill control equipment utilization. Reference is made to the anticipated application of techniques and response procedures for the specific locations and to the pre-planning features of this Contingency Plan. It is re-emphasized again, however, that on-the-spot training sessions and in-the-field adjustments to make response effective must override stereotyped, preconceived actions.

1. Lower Piceance Creek - Area 1

The complex drainage system of Piceance Creek the recorded periods of high runoff (also Roan Creek) almost necessitates location of the primary recovery site on the main stream with secondary or advance sites being located upstream.

The previously described techniques for recovery of oil from

narrow, shallow and fast flowing streams are applicable at the locations pictured in Figures 18 and 19. In these cases the use of in-place systems of irrigation gates, bridges and culverts are adaptable to incorporation into the containment and recovery methods.

2. East Salt Creek Below Highway 139 - Area 2

Containment and recovery of oil entering a stream, that for much of the year has sufficient flow to carry the oil over a considerable distance, can be described by use of East Salt Creek as an example.

The conditions controlling response action in this area have been covered in the analysis of Area 2. Many of the general techniques and equipment applications already described would be utilized to contain and recover oil from East Salt Creek. The location of the two advance recovery sites shown on Figure 14 and site features shown in Figure 20 suggest the applicability for the use of earthen dams with siphons or barriers at bridge crossings as shown in Figures 9 and 11.

Both the location on Mitchell Road and at 10 Road near the Highline Canal can be readily reached, essentially year round and in a relatively short time from Grand Junction. The time required to respond to a spill and equipment availability are critical during times of the year when stream flow rates are high. High rates of flow were measured during the environmental inventory survey period of May, 1973 (6 ft./sec. or about 4 miles per hour). At times



From bridge below Square  
S Ranch showing irrigation  
 diversion



From bridge below Square  
S Ranch

Figure 18. Lower Piceance Creek primary recovery site.



Culvert at Black Sulfur Creek



Fence at Hunter Creek



Stock pond and reservoir  
off Upper Piceance



Bridge location on 10 road  
below Highline Canal siphon



Mitchell road crossing  
during no flow period

Figure 20. Recovery locations along East Salt Creek.

this stream might flow at rates even higher than observed, and consequently require a short lead time to on-scene response. The distance from the point of a spill along the pipeline right-of-way and the stream flow rates have been taken into account in the selection of the multiple recovery points so as to allow for the possibility of the collection of oil at one or several locations.

3. West Salt Creek - Area 3

The pipeline crosses north of the Highline irrigation system; and due to the right-of-way location and the irrigation system design, any oil leaked from the pipeline would be isolated from the system proper. The overflow of the Main Highline Canal, which drains into West Salt Creek, is shown in Figure 16. Although the pipeline crosses the natural drainage above this point, a possibility still exists that spilled oil might use West Salt Creek as an avenue of flow into the Colorado.

In most cases natural or manmade features can be used to assist recovery operations. Figure 21 demonstrates the ready-made adaptability of this particular recovery location shown. In this case a diversion of the stream has been made by a timber diverting vane, a quiet water ditch has been cut and a pump-off pit has already been dug. While this combination was used for water diversion and supply, the application is adaptable to oil recovery situations.

4. Colorado River Above Moab - Area 3

As described in the response analysis for Area 3, most spills



Diversion of stream channel



Quiet area showing control  
weir and pump



Pump of pit showing siphon  
return to main stream

Figure 21. Recovery point on West Salt Creek at Hwy. 6.

(E-7)

would be confined to dry land or dry wash bottoms in the areas of the numerous washes crossed north of Highways 70 and 6 and the railroad grade.

Because of the possibility of a spill during spring runoff when lead time to respond is short, a Colorado River location below the major washes was located. This site provides access by way of Highway 128, good off-river storage adaptability and a split in the channel for recovery behind an island.

An island, as shown in Figure 22, can be utilized in the containment and recovery concept as shown in Figure 23.

5. Upper Courthouse Wash - Area 4

As described in the Area 4 discussion, an oil leak would most likely be confined to a right-of-way or in the case of a dry stream or side draw crossing to the confines of the drainage bottom.

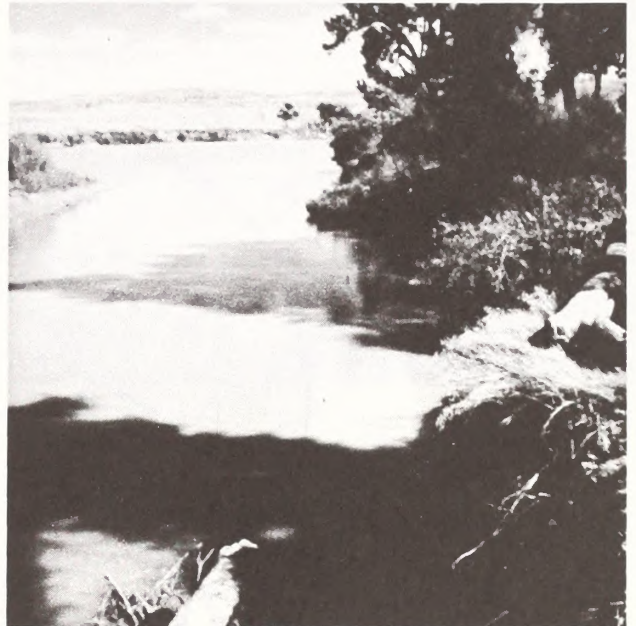
The locations shown in the Figure 24 photos are used as examples of possible recovery sites in a desert terrain. The locations within Arches Park on Salt Wash and Lower Courthouse Wash mentioned in the Area 4 response analysis are shown in Figure 25.

6. Lower Mill Creek from Pack Creek - Area 6

While it would be desirable and in most cases possible for oil leaks in Area 6 to be contained outside the town limits of Moab,



Split flow in river and  
island at bend in river

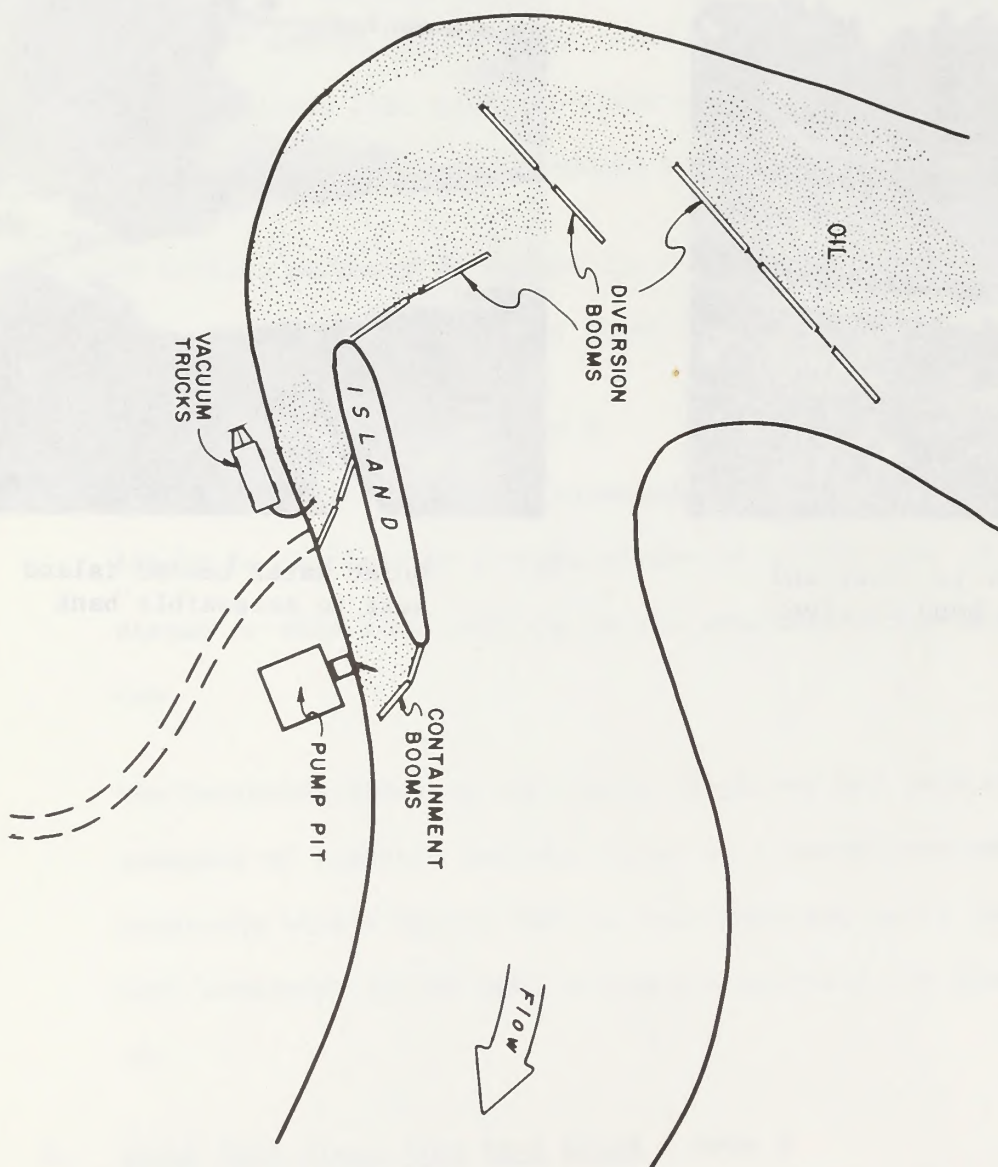


Quiet water behind island  
next to accessible bank

Figure 22. Recovery location on Colorado below Sagers Wash.

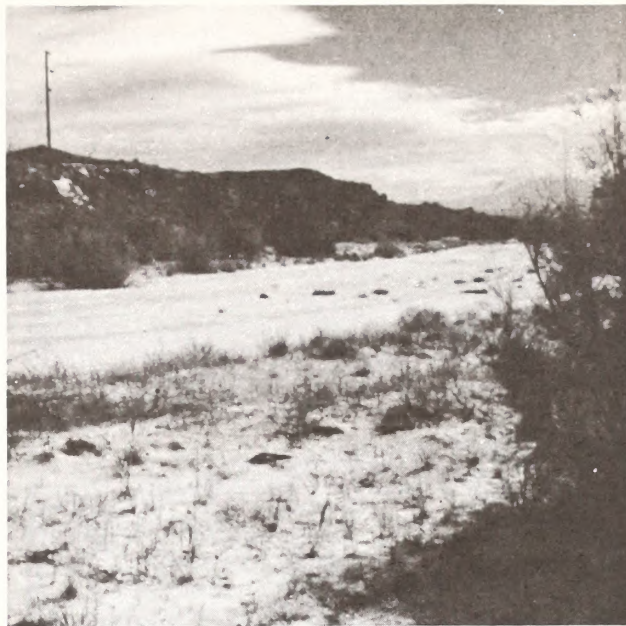
# COLORADO RIVER CONTAINMENT AND RECOVERY

Figure 23





Railroad drainage and barrier  
Above Hwy. 160 railroad  
crossing



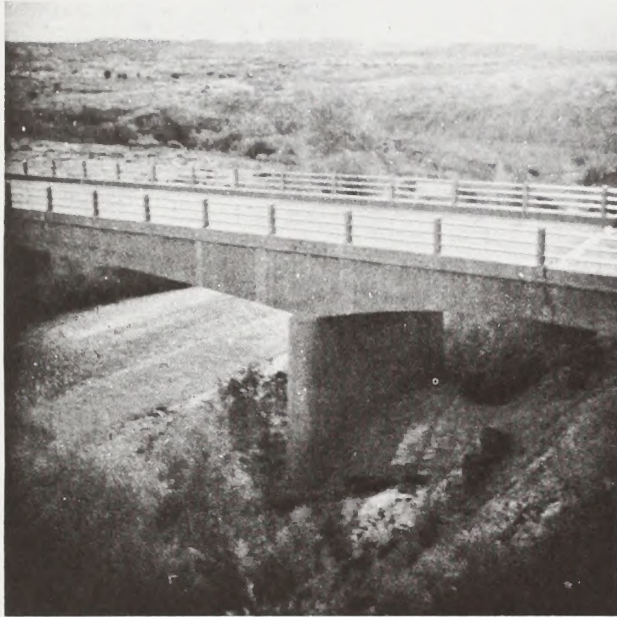
Upper Courthouse Wash below  
Hwy. 160 stream crossing



Bridge on old road at Moab Canyon exit

Figure 24. Recovery sites in Area 4 in dry washes and drainages.

(E-11)



Main park road crossing  
of lower Courthouse Wash



Road crossing of Salt  
Wash at Turnbow Cabin

Figure 25. Accessible recovery locations inside Arches Park.

a planned recovery location allowing sufficient lead time to respond to a high flow rate condition on Pack Creek was needed. Such a location is at the bridge over Mill Creek above its entry into the Colorado River.

This location is not the most desirable because of the steep side banks down to the stream bed and a straight path for the stream through this point. It does, however, provide the advantage of quick and direct access in addition to having a bridge structure in a place which may be used in conjunction with containment and recovery applications.

As noted in the picture in Figure 26, an absorbent barrier application is adaptable to these conditions.

7. Kane Springs Canyon - Area 7

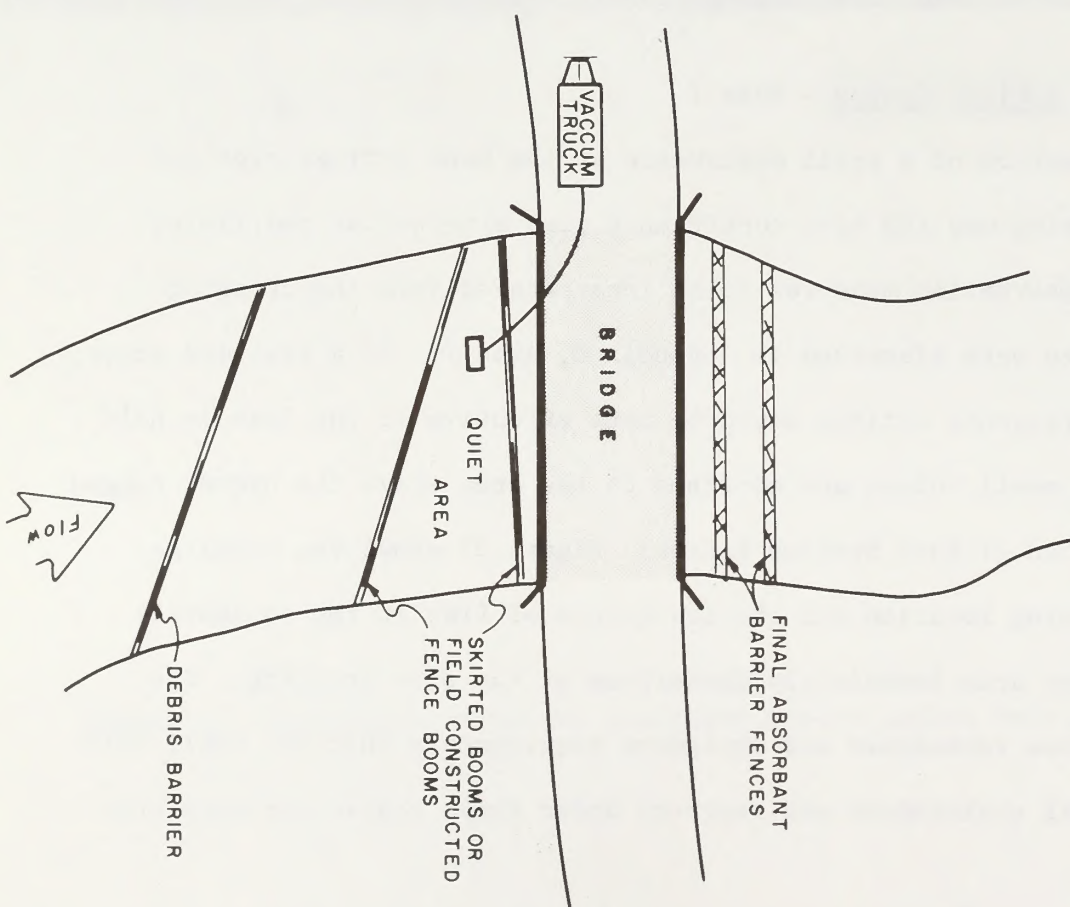
Prevention of a spill occurrence at the Kane Springs pipeline crossing was the best contingency plan alternative available. The prevention measures to be incorporated into the crossing design were discussed in Appendix D, Area 7. If a leak did occur, the response actions would be more effective if the leak is held to a small volume and confined to the area above the narrow rugged section of Kane Springs Canyon. Figure 27 shows the pipeline crossing location and the low volume of flow in the accessible valley area immediately downstream of the pipe crossing. The various techniques and equipment requirements that are applicable to oil containment and recovery under these conditions have pre-

# RECOVERY LOCATION FOR PACK CREEK RUN OFF

Figure 26

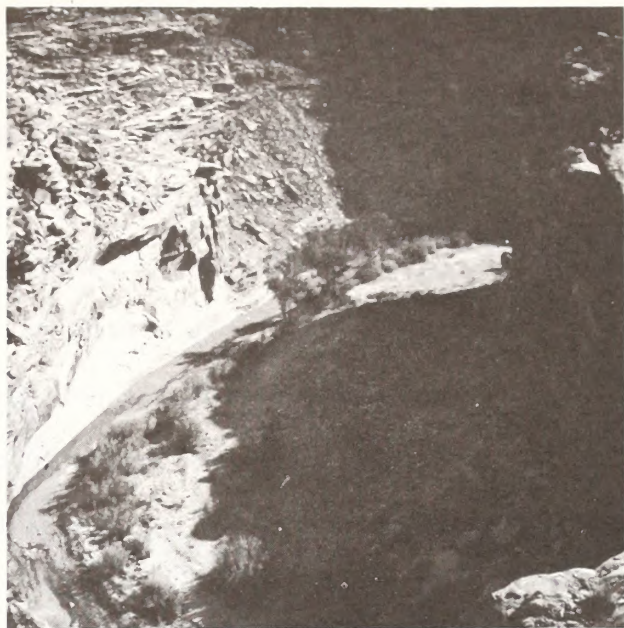


Bridge over Mill Creek  
above entry to Colorado

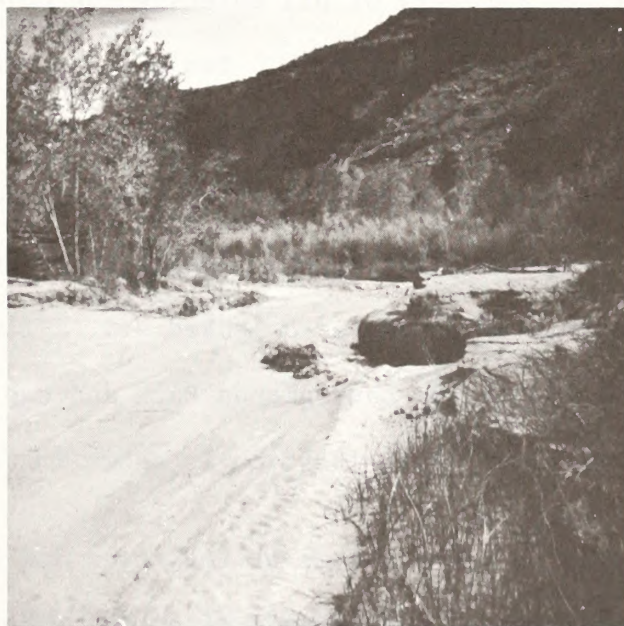




Exit of Kane Springs



Part of lower Kane Springs Canyon



Primary recovery site  
at no flow period of September, 1973

Figure 27. Recovery locations from lower end of Kane Springs.

viously been described.

In the event of the flushing of oil from a spill into the lower area of Kane Springs Canyon, one or more acceptable recovery sites have been located. The photographs in Figure 28 show the dry condition of the stream bed above the exit of Kane Springs into the Colorado and the points at which recovery could be attempted during periods of heavy runoff. These sites provide lead time to respond to a spill, access for men and equipment and are acceptable from the standpoint of equipment deployment, recovery and storage of contained oil.

8. Colorado River Downstream of Moab - Area 5

Two primary recovery locations were designated as potential sites for containment and recovery of oil entering the Colorado River below the pipeline crossing at Moab. Two primary recovery locations have been located in preparation for the necessity of multiple major recovery efforts on a river such as the Colorado. The location below the potash plant is the favored location because it restricts the extent of exposure to leaked oil, allows operations to be conducted outside of the Canyonlands Park and has overall better logistic possibilities. This location is shown in Figure 29.

In order to emphasize the problems of logistics and lead time to set up equipment ahead of the arrival of an oil front, the downstream location near Lathrop Canyon will be discussed. This location is shown in Figure 30.

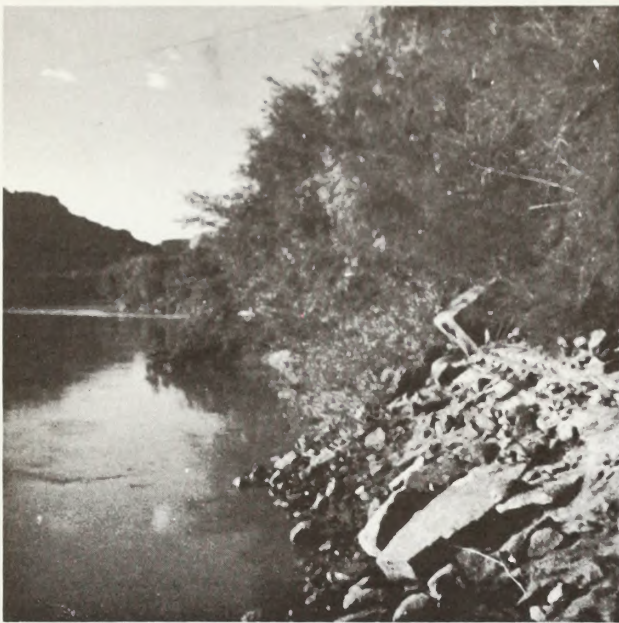


Pipeline crossing point



Approximately 1/2 mile below crossing

Figure 28. Upper Kane Spring recovery.



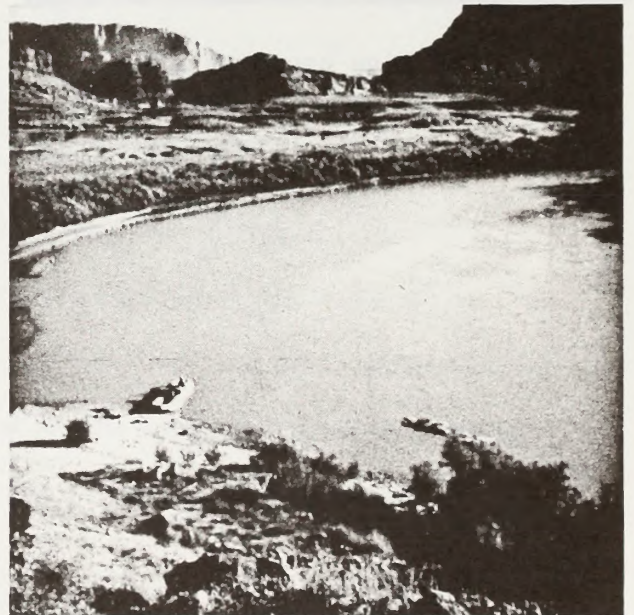
Above Potash plant water intake



Recovery area below Potash



Oil well pit in recovery area



Potash boat launch site

Figure 29. Primary recovery site - 17 river miles below Colorado crossing at Moab.



Flat landing site at low water



Narrows at low water



River opens into wide turn



Flat helicopter site above high water

Figure 30. Primary recovery location 40 river miles below Colorado River crossing at Moab.

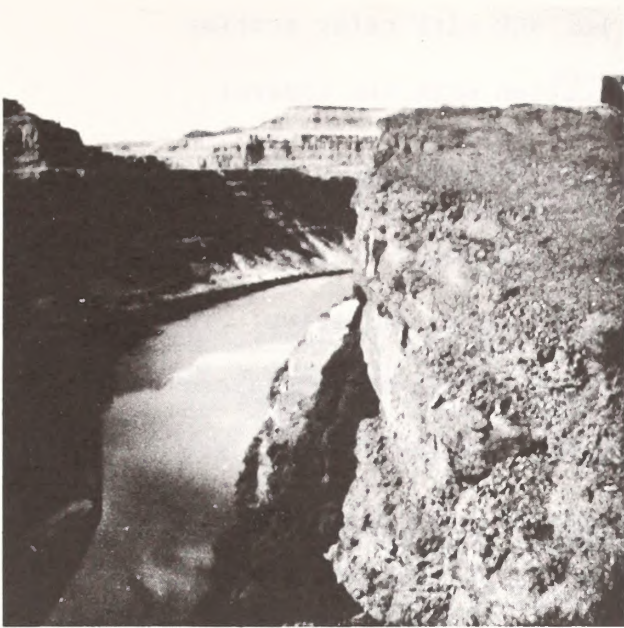
Access to the Colorado by way of Lathrop Canyon is possible during dry periods by way of a sometimes narrow road or trail passable with a 4-wheel drive vehicle. Points along this route of access are shown in Figure 31.

From Potash it is possible to reach this point on the river some 40 river miles from the crossing point in about three hours.

Multiple and alternative modes of transportation and supply must be anticipated due to variable access due to weather conditions. By jet boat the site could be reached in about 1 1/2 hours after retainment of available boats. The flat low plateau area immediately adjacent to the river is capable of handling helicopter support.

Fortunately, this area of the river provides natural features that are conducive to effective recovery operations. It should be noted, however, that ideally access by land to both sides of the river would be desirable. In order to effect containment on the Colorado in the region below the pipeline crossing, water is considered necessary for the setting of anchors, boom placement, oil recovery equipment manipulation and debris clearance.

It would be possible to bring in small earth moving equipment by land and materials such as straw by helicopter. Additional equipment and personnel can be transported by either of the above modes or by boat. Because of the isolated nature of the location, food, water and camping facilities would have to be supplied.



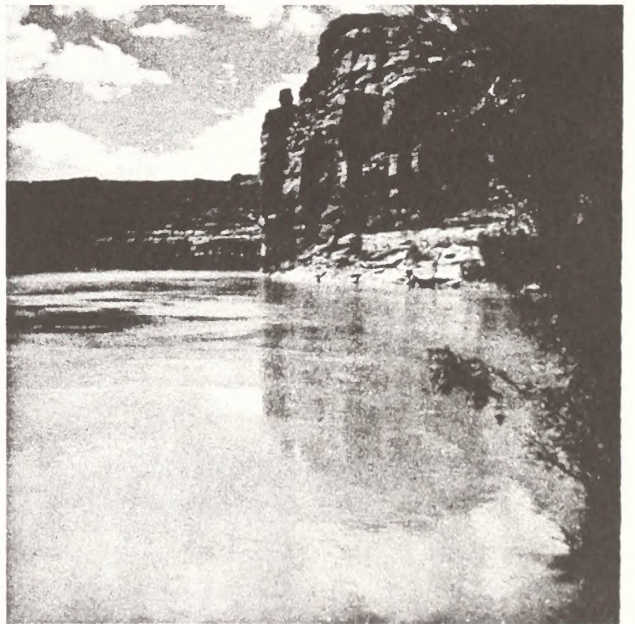
Inaccessibility along Colorado



Section of trail to Lathrop Canyon



Route down through Lathrop Canyon



Exit at Lathrop Canyon

Figure 31. Access route to Lathrop Canyon recovery point by land.

Communication imposes some problem, but VHF with relay station adaptions will allow adequate communication with the control center in Moab.

In this section of the River, the flow rate tends to slow down, the river narrows and then widens as it changes direction. The west bank offers a flat area for recovery of oil and entrained water to a land base for further disposal. These features are desirable from the standpoint of diversion containment and recovery of oil under conditions of high flow rates from a wide river that cannot effectively be bridged by containment devices. Reference to the applicable containment methods are shown by Figure 10.

## REFERENCES

1. Ecological Analysis of Potential Shale Oil Products Pipeline Corridors in Colorado and Utah--Thorne Ecological Institute, August 1973
2. Environmental Setting, Impact Mitigation and Recommendations for a Proposed Products Pipeline Between Lisbon Valley, Utah and Parachute Creek, Colorado--Utah Environmental and Agricultural Consultants, August 1973
3. General Geotechnical Conditions Along the Proposed Shale Oil Pipeline, Parachute Creek, Colorado to Lisbon Station, Utah--Woodward-Lundgren & Associates, November 1973
4. EPA Region VIII - Oil and Hazardous Substances Pollution Contingency Plan - November 1971
5. State of Utah, Hazardous Spills Directory--Utah State Division of Health, September 1972
6. Procedure and Directory for Reporting Spills of Oil and Hazardous Materials--Colorado Department of Health
7. National Oil and Hazardous Substances Pollution Contingency Plan--Council on Environmental Quality, August 1973
8. Department of Transportation - Title 49, Chapter 1, Part 195, Transportation of Liquids by Pipeline
9. Department of Transportation, Summary of Liquid Pipeline Accidents Reported on DOT Form 7000-1, 1972, 1971, 1970, 1969, & 1968
10. Federal Water Pollution Control Act Amendments of 1972
11. ARCO Pipe Line Company, Standard Instruction No. 6 - 14 - Oil Spills Contingency Plan, August 1972

References cont'd.

12. Environmental Impact Analysis-Pipeline--Woodward-Envicon, Inc.,  
(for Colony Development Operation) October 1973
13. Biological Effects of Oil Pollution, Selected Bibliography II,  
pp. 213-483, November 1972

## APPENDIX 2

### ANNUAL PRECIPITATION AND TEMPERATURE RECORDS



LONGTIME MONTHLY AND ANNUAL PRECIPITATION AND TEMPERATURE RECORDS  
FOR LOCATIONS NEAREST THE PROPOSED PIPELINE ROUTE

STATION	MONTH												AVE
	J	F	M	A	M	J	J	A	S	O	N	D	
La Sal Elev. 6,960 ft.													
Precip (In.)	1.09	.96	.89	1.07	.80	.71	1.35	1.62	1.16	1.47	.78	.90	12.8
Temp (° F)	27.1	36.8	44.4	46.7	54.0	64.6	71.9	---	---	---	---	---	---
Frost Free						X	X	X	X				
Moab Elev. 3,965 ft.													
Precip (In.)	.56	.66	.69	.76	.58	.41	.52	.89	.73	1.04	.65	.69	8.18
Temp (° F)	30.3	36.9	46.3	56.7	65.6	74.2	80.9	78.0	69.8	57.0	41.7	33.2	55.9
Frost Free				X	X	X	X	X	X	X			
Thompson Elev. 5,158 ft.													
Precip (In.)	.74	.51	.69	.75	.59	.48	.62	1.08	.78	1.08	.47	.73	8.62
Temp (° F)	26.8	32.9	41.9	52.3	61.7	71.4	78.6	76.1	68.1	55.4	39.5	30.3	52.9
Frost Free					X	X	X	X	X	X			
Fruita Elev. 4,507 ft.													
Precip (In.)	.73	.64	.75	.74	.48	.44	.65	1.02	.89	.77	.58	.63	8.31
Temp (° F)	26.0	32.2	41.3	51.6	61.0	69.4	75.9	73.3	64.9	52.7	37.4	28.5	51.2
Frost Free					X	X	X	X	X				
Grand Junction Elev. 4,855 ft.													
Precip (In.)	.64	.69	.75	.75	.60	.42	.57	1.07	.91	.74	.58	.57	8.29
Temp (° F)	26.0	32.6	41.5	52.3	62.2	71.3	78.2	75.5	67.8	55.0	38.8	29.1	52.5
Frost Free					X	X	X	X	X	X			
Altenbern Elev. 5,690 ft.													
Precip (In.)	.70	.74	.88	.82	1.33	2.45	1.01	.64	1.66	4.02	1.11	1.99	15.23
Temp (° F)	20.8	30.4	40.2	45.5	55.0	63.2	70.2	68.2	59.6	49.4	32.0	19.4	47.4
Frost Free					X	X	X	X	X				

\*At least half of the month must follow the average date for the first killing frost (32°F) in fall and precede the average date for the last killing frost (32°F) in spring to be included as a frost free month.



## APPENDIX 3

### MERCALLI SCALE DEFINITIONS



## MODIFIED MERCALLI INTENSITY SCALE

The Modified Mercalli Intensity Scale describes earthquakes by their effects for twelve grades of intensity. Each grade is assigned a Roman Numeral as listed below.

- I. Not felt. Marginal and long-period effects of large earthquakes.
- II. Felt by persons at rest, on upper floors, or favorably placed.
- III. Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
- IV. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak.
- V. Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
- VI. Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry cracked. Small bells ring (church, school). Trees, bushes shaken.
- VII. Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and

- architectural ornaments - CFR) . Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving-in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
- VIII. Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
- IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas, sand and mud affected, earthquake fountains, sand craters.
- X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches, and flat land. Rails bent slightly.
- XI. Rails bent greatly. Underground pipelines completely out of service.
- XII. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

## APPENDIX 4

### LIST OF LIVING ORGANISMS



## TREES (1)

<u>Common Name</u>	<u>Scientific Name</u>
Alder	Alnus sp.
Box elder	Acer negundo var. interius
Broadleaf cottonwood	Populus sargentii
Douglas fir	Pseudotsuga menziesii
Engelmann spruce	Picea engelmanni
Limber pine	Pinus flexilis
Lodgepole pine	Pinus contorta var. latifolia
Narrowleaf cottonwood	Populus angustifolia
One-seeded juniper	Juniperus monosperma
Pinyon pine	Pinus edulis
Ponderosa pine	Pinus ponderosa
Quaking aspen	Populus tremuloides
Red cedar	Juniperus virginiana var. scopulorum
Russian olive	Elaeagnus angustifolia
Salt cedar (Tamarisk)	Tamarix gallica
Subalpine fir	Abies lasiocarpa
Utah juniper	Juniperus utahensis

## SHRUBS (1)

<u>Common Name</u>	<u>Scientific Name</u>
Alpine prickly currant	<i>Ribes montigenum</i>
Big sagebrush	<i>Artemisia tridentata</i>
Bitterbrush	<i>Purshia tridentata</i>
Blackbrush	<i>Coleogyne ramosissima</i>
Broom huckleberry	<i>Vaccinium scoparium</i>
Buckbrush	<i>Ceanothus fendleri</i>
Buffalo-berry	<i>Shepherdia canadensis</i>
Bush honeysuckle	<i>Lonicera involucrata</i>
Choke cherry	<i>Prunus virginia</i> var. <i>melanocarpa</i>
Common gooseberry	<i>Ribes inerme</i>
Common juniper	<i>Juniperus communis</i>
Currant	<i>Ribes wolfii</i>
Four-winged saltbush	<i>Atriplex canescens</i>
Gambel oak	<i>Quercus gambelii</i>
Greasewood	<i>Sarcobatus vermiculatus</i>
Kinnikinnik	<i>Arctostaphylos uva-ursi</i>
Linear-leaved wormwood	<i>Artemisia dracunculus</i>
Manzanita	<i>Arctostaphylos patula</i>
Mormon tea	<i>Ephedra nevadensis</i>
Mountain ash	<i>Sorbus scopulina</i>
Mountain lover	<i>Pachystima myrsinites</i>
Mountain mahogany	<i>Cercocarpus montanus</i>
Mountain maple	<i>Acer glabrum</i>
Myrtle blueberry	<i>Vaccinium myrtillus</i>
Nuttall's saltbush	<i>Atriplex nuttallii</i>
Oregon grape	<i>Mahonia aquifolium</i>
Pasture sagebrush	<i>Artemisia frigida</i>
Planeleaf willow	<i>Salix planifolia</i>

## SHRUBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Prairie sage	Artemisia ludoviciana
Rabbitbrush	Chrysothamnus nauseosus
Rabbitbrush	Chrysothamnus parryi
Red-berried elder	Sambucus racemosa
Red-osier dogwood	Cornus stolonifera
Rubber rabbitbrush	Chrysothamnus sp.
Sagebrush	Artemisia cana
Sandbar willow	Salix exigua
Serviceberry	Amelanchier alnifolia
Shadscale	Atriplex confertifolia
Shrubby cinquefoil	Pentaphylloides floribunda
Skunkbrush	Rhus trilobata
Snakeweed	Gutierrezia sarothrae
Snowberry	Symphoricarpos albus
Snowberry	Symphoricarpos oreophilus
Squawapple	Peraphyllum ramosissimum
Sticky laurel	Ceanothus velutinus
Thimble-berry	Rubus parviflorus
Wax currant	Ribes cereum
Waxflower	Jamesia americana
Western virgin's-bower	Clematis ligusticifolia
Wild red raspberry	Rubus idaeus
Willow	Salix sp.
Wood's rose	Rosa woodsii

## CRYPTOGAMS (1)

<u>Common Name</u>	<u>Scientific Name</u>
Field Horsetail	Equisetum arvense
Lichen	Alectoria sp.
Lichen	Cladonia sp.
Lichen	Cladonia pyxidata
Lichen	Lecanora sp.
Lichen	Parmelia chlorochroa
Lichen	Parmelia sulcata
Lichen	Parmelia wyomingica
Lichen	Peltigera canina
Lichen	Peltigera canina var. rufescens
Lichen	Physcia sp.
Lichen	Stereocaulon sp.
Old man's beard	Usnea sp.
Rock Selaginella	Selaginella densa
Tall scouring-rush	Equisetum hyemale

## HERBS (1)

### Common Name

### Scientific Name

Alfalfa	Medicago sativa
Alkali sacaton	Sporobolus airoides
Alpine bishop's cap	Mitella pentandra
Alsike clover	Trifolium hybridum
American pasqueflower	Pulsatilla patens ssp. multifida
Angelica	Angelica grayi
Arizona fescue	Festuca arizonica
Arnica	Arnica cordifolia
Arnica	Arnica mollis
Avalanche lily	Erythronium grandiflorum
Baby blue-eyes	Nemophila breviflora
Balsam-root	Balsamorhiza sp.
Beard-tongue	Penstemon comarrhenus
Beard-tongue	Penstemon rydbergii
Beard-tongue	Penstemon watsonii
Beard-tongue	Penstemon whippleanus
Bistort	Bistorta bistortoides
Bittercress	Cardamine cordifolia
Black-eyed Susan	Rudbeckia hirta
Black medic	Medicago lupulina
Blanketflower	Gaillardia sp.
Blue-eyed Mary	Collinsia parviflora
Blue grama	Bouteloua gracilis
Bluegrass	Poa agassizensis
Blue wildrye	Elymus glaucus
Blunt-leaved chickweed	Moehringia lateriflora
Bottlebrush squirreltail	Sitanion hystrix
Bracken	Pteridium aquilinum
Bracted alum-root	Heuchera bracteata
Brome	Bromus polyanthus

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Brook saxifrage	Saxifraga odontoloma
Buttercup	Ranunculus inamoenus
Butterweed	Senecio bigelovii
Butterweed	Senecio crocatus
Butterweed	Senecio integerrimus
Butterweed	Senecio mutabilis
Butterweed	Senecio pudicus
Butterweed	Senecio rapifolius
Butterweed	Senecio serra var. admirabilis
Butterweed	Senecio triangularis
Cactus	Opuntia sp.
Canada wildrye	Elymus canadensis
Canadian reed-grass	Calamagrostis canadensis
Carrot	Podistera eastwoodiae
Cattail	Typha latifolia
Cheatgrass	Bromus tectorum
Cinquefoil	Potentilla conqinna
Cinquefoil	Potentilla diversifolia
Cinquefoil	Potentilla quinquefolia
Clasping peppergrass	Lepidium perfoliatum
Clover	Trifolium procumbens
Clustered cancer root	Orobanche fasciculata
Colorado blue columbine	Aquilegia caerulea
Colorado loco	Oxytropis lambertii
Colorado wildrye	Elymus ambiguus
Columbia needlegrass	Stipa columbiana
Common dandelion	Taraxacum officinales

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Common harebell	Campanula rotundifolia
Common horehound	Marrubium vulgare
Common lupine	Lupinus argenteus
Common phlox	Phlox multiflora
Common plantain	Plantago major
Common rattlesnake plantain	Goodyera oblongifolia
Common wild geranium	Geranium fremontii
Copper mallow	Sphaeralcea coccinea
Corralroot	Corallorhiza
Cowbane	Oxypolis fendleri
Cow parsnip	Heracleum lanatum
Creeping milkweed	Asclepias capricornu asperula
Creeping wintergreen	Gaultheria humifusa
Curled lousewort	Pedicularis racemosa
Cut-leaved nightshade	Solanum triflorum
Daisy	Erigeron caespitosus
Daisy	Erigeron compositus
Daisy	Erigeron coulteri
Daisy	Erigeron superbus
Daisy	Erigeron ursinus
Death camas	Zygadenus elegans
Elephantella	Pedicularis groenlandica
Elk sedge	Carex geyeri
Engelmann aster	Aster Engelmannii
Eriogonum	Eriogonum racemosum
Eriogonum	Eriogonum subalpinum
Euphorbia	Euphorbia sp.

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
False boneset	Kuhnia eupatorioides
False forget-me-not	Hackelia floribunda
False hellebore	Veratrum tenuipetalum
False yarrow	Chaenactis alpina
Fescue	Festuca brachyphylla
Few-flowered false Solomon's seal	Smilacina stellata
Few-flowered meadow-rue	Thalictrum sparsiflorum
Field mouse-ear	Cerastium arvense
Fireweed	Epilobium angustifolium
Fireweed	Epilobium cf leptophyllum
Fragrant bedstraw	Galium trifolium
Galleta-grass	Hilaria jamesii
Giant-hyssop	Agastache foeniculum
Giant wildrye	Elymus cinereus
Glaudous aster	Aster glaucodes
Globeflower	Trollius laxus var. albiflorus
Golden aster	Heterotheca fulcrata
Golden aster	Heterotheca villosa
Golden banner	Thermopsis montana
Goldenrod	Petradoria pumila
Goldenrod	Solidago multiradiata
Goldenrod	Solidago sparsiflora
Goldenweed	Happlopappus parryi
Goosegrass	Galium aparine
Gray's lousewort	Pedicularis grayi
Green mertensia	Mertensia viridis
Gumweed	Grindelia squarrosa

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Halogeton	Halogeton glomeratus
Hawksbeard	Crepis acuminata
Hawksbeard	Crepis runcinata
Hawkweed	Hieracium albiflorum
Hawthorne	Crataegus sp.
Heart-leaved buttercup	Ranunculus cardiophyllus
Hemlock parsley	Conioselinum scopulorum
Hyssop	Agastache urticifolia
Indian ricegrass	Oryzopsis hymenoides
Jacob's ladder	Polemonium pulcherrimum var. delicatum
June grass	Koeleria cristata
Kentucky bluegrass	Poa pratensis
King's crown	Clementsia rhodantha
Large-bracted vervain	Verbena bracteata
Larkspur	Delphinium barbeyi
Larkspur	Delphinium nelsonii
Leafy-bracted aster	Aster foliaceus
Leafy Jacob's ladder	Polemonium foliosissimum
Letterman needlegrass	Stipa lettermanii
Linear-leaved wormwood	Artemisia dracunculus
Little gentian	Gentianella amarella
Little sunflower	Helianthella quinquenervis
Locoweed	Oxytropis obnapiformis
Long-leaved phlox	Phlox longifolia
Loose flowered milkvetch	Astragalus tenellus
Lovage	Ligusticum porteri
Low daisy	Erigeron pumilus
Lupine	Lupinus kingii var. argillaceus

HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Mariposa lily, sego lily	<i>Calochortus gunnisonii</i>
Marsh marigold	<i>Caltha leptosepala</i>
Meadow-rue	<i>Thalictrum fendleri</i>
Meadow-rue	<i>Thalictrum</i> sp.
Milkvetch	<i>Astragalus diversifolius</i>
Milkvetch	<i>Astragalus lutosus</i>
Miner's candle	<i>Cryptantha virgata</i>
Monkey flower	<i>Mimulus guttatus</i>
Montia	<i>Montia</i> sp.
Monument plant	<i>Frasera speciosa</i>
Morning glory	<i>Convolvulus arvensis</i>
Mountain brome	<i>Bromus marginatus</i>
Mountain muhly	<i>Muhlenbergia montana</i>
Mule-ears	<i>Wyethia amplexicaulis</i>
Mule-ears	<i>Wyethia arizonica</i>
Mutton grass	<i>Poa fendleriana</i>
Needle-and-thread	<i>Stipa comata</i>
Niggerhead	<i>Rudbeckia occidentalis</i> var. <i>montana</i>
Nodding bluegrass	<i>Poa reflexa</i>
Northern bedstraw	<i>Galium boreale</i>
Oats	<i>Avena</i> sp.
One-sided wintergreen	<i>Ramischia secunda</i>
Orange paintbrush	<i>Castilleja integra</i>
Orange sneezeweed	<i>Helenium hoopesii</i>
Orchid	<i>Coeloglossum viride</i> ssp. <i>bracteatum</i>
Oregon grape	<i>Mahonia repens</i>
Pacific aster	<i>Aster chilensis</i>
Paintbrush	<i>Castilleja flava</i>
Paintbrush	<i>Castilleja rhexifolia</i>

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Paperflower	<i>Psilotrophe bakeri</i>
Parry lousewort	<i>Pedicularis parryi</i>
Pearly everlasting	<i>Anaphalis margaritacea</i>
Peppergrass	<i>Lepidium montanum</i>
Pine drops	<i>Pterospora andromedea</i>
Pipsissewa	<i>Chimaphila umbellata</i>
Plantainleaf buttercup	<i>Ranunculus alismaefolius</i>
Prairie sunflower	<i>Helianthus petiolaris</i>
Prickly gilia	<i>Leptodactylon pungens</i> ssp <i>brevifolium</i>
Prince's plume	<i>Stanleya pinnata</i>
Purple oniongrass	<i>Melica spectabilis</i>
Pussytoes	<i>Antennaria paryifolia</i>
Pussytoes	<i>Antennaria rosea</i>
Quackgrass	<i>Agropyron repens</i>
Red threeawn	<i>Aristida longiseta</i>
Reed	<i>Phragmites austrealis</i>
Rock-cress	<i>Arabis drummondii</i>
Rock-primrose	<i>Androsace septentrionalis</i>
Rocky Mountain bee plant	<i>Cleome lutea</i>
Rocky Mountain bee plant	<i>Cleome serrulata</i>
Rush	<i>Juncus arcticus</i> ssp. <i>ater</i>
Rush	<i>Juncus drummondii</i>
Rush	<i>Juncus mertensianus</i> ssp <i>gracilis</i>
Russian-thistle	<i>Salsola iberica</i>
Russian-thistle	<i>Salsola kali</i> ssp. <i>ruthenica</i>
Salina wildrye	<i>Elymus salina</i>
Salsify	<i>Tragopogon dubius</i>
Saltgrass	<i>Distichlis stricta</i>
Sand dropseed	<i>Sporobolus cryptandrus</i>

HERBS (Cont.)

Common Name

Scientific Name

Sandwort	Arenaria congesta
Sandwort	Arenaria fendleri
Saxifrage	Saxifraga rhomboidea
Scarlet paintbrush	Castilleja miniata
Sea-blite	Suaeda sp.
Sedge	Carex aquatilis
Sedge	Carex disperma
Sedge	Carex egglestoni
Sedge	Carex hoodii
Sedge	Carex illota
Sedge	Carex microptera
Sedge	Carex obtusata
Sedge	Carex pyrenica
Sedge	Carex scopulorum
Sego lily	Calochortus nuttallii
Showy daisy	Erigeron speciosus var. macranthus
Showy goldeneye	Gymnolomia multiflora
Sibbaldia	Sibbaldia procumbens
Silverweed	Potentilla anserina
Skyrocket	Gilia sp.
Slender hawkweed	Hieracium gracile
Slender wheatgrass	Agropyron trachycaulum
Slenderleaf gilia	Collomia linearis
Small-flowered penstemon	Penstemon procerus
Smooth blue aster	Aster laevis
Smooth daisy	Erigeron glabellus
Smooth goldenrod	Solidago missouriensis
Snakeweed	Gutierrezia sarothrae
Soft cinquefoil	Potentilla gracilis var. pulcherrima

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Spike trisetum	Trisetum spicatum
Spiked fescue	Leucopoa kingii
Squirrel-tail	Sitanion longifolium
Standard wheatgrass	Agropyron desertorum
Stick leaf	Mentzelia montana
Stickweed	Lappula redowski
Sticky cinquefoil	Potentilla fissa
Stinging nettle	Urtica dioica ssp. gracilis
Stonecrop	Sedum lanceolatum
Strawberry	Fragaria vesca var. bracteata
Strawberry	Fragaria virginiana var. platypetala
Subalpine daisy	Erigeron peregrinus
Sugarbowls	Clematis hirsutissima
Sullivantia	Sullivantia purpusi
Sulphur-flower	Eriogonum umbellatum
Sunflower	Helianthella uniflora var. uniflora
Sweet anise	Osmorhiza occidentalis
Sweet cicely	Osmorhiza chilensis
Sweet cicely	Osmorhiza depauperata
Tall coneflower	Rudebeckia laciniata var. ampla
Tall fleabane	Erigeron elatior
Tall mertensia	Mertensia ciliata
Tansy mustard	Descurainia pinnata
Thistle	Cirsium canescens
Thistle	Cirsium centaureae
Thistle	Cirsium pulchellum

## HERBS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Three-flowered avens	Geum triflorum
Timothy	Phleum pratense
Trailing fleabane	Erigeron flagellaris
Tuber starwort	Stellaria jamesiana
Tufted hairgrass	Deschampsia caespitosa
Twayblade	Listera cordata
Valerian	Valeriana edulis
Vetch	Vicia americana
Violet	Viola adunca
Violet	Viola canadensis
Violet	Viola nuttallii
Violet	Viola purpurea ssp venosa
Waterleaf	Hydrophyllum capitatum
Western tansy mustard	Descurainia richardsonii
Western wheatgrass	Agropyron smithii
Western yarrow	Achillea lanulosa
Wheatgrass	Agropyron scribneri
Whiskbroom parsley	Harbouria trachypleura
White checkermallow	Sidalcea candida
White-flowered peavine	Lathyrus leucanthus
White geranium	Geranium richardsonii
White sweetclover	Melilotus alba
Wild candy-tuft	Thlaspi montanum
Wild flax	Linum lewisii
Wild hops	Humulus lupulus var. neomexicana
Wild iris	Iris missouriensis
Wild onion	Allium geayeri
Wintercress	Barbarea orthoceras
Wintergreen	Pyrola sp.
Wintergreen	Pyrola virens

## HERBS (Cont.)

### Common Name

### Scientific Name

Wood bluegrass

*Poa nemoralis* ssp *interior*

Wooly cinquefoil

*Potentilla hippiana*

Yellow columbine

*Aquilegia micrantha*

Yellow eriogonum

*Eriogonum flavum*

Yellow mountain parsley

*Pseudocymopterus montanus*

Yellow paintbrush

*Castilleja sulphurea*

Yellow sweetclover

*Melilotus officinalis*

*Yucca*

*Yucca glauca*

## MAMMALS (2)

<u>Common Name</u>	<u>Scientific Name</u>
Apache pocket mouse	<i>Perognathus apache</i>
Badger	<i>Taxidea taxus</i>
Beaver	<i>Castor canadensis</i>
Big brown bat	<i>Eptesicus fuscus</i>
Black bear	<i>Ursus americanus</i>
Black-footed ferret*	<i>Mustela nigripes</i>
Black-tailed jack rabbit	<i>Lepus californicus</i>
Bobcat	<i>Lynx rufus</i>
Bushy-tailed wood rat	<i>Neotoma cinerea</i>
California myotis	<i>Myotis californicus</i>
Canyon mouse	<i>Peromyscus crinitus</i>
Colorado chipmunk	<i>Eutamias quadrivittatus</i>
Coyote	<i>Canis latrans</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Desert cottontail	<i>Sylvilagus audubonii</i>
Desert wood rat	<i>Neotoma lepida</i>
Elk	<i>Cervus canadensis</i>
Gapper's red-backed vole	<i>Clethrionomys gapperi</i>
Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
Kit fox	<i>Vulpes macrotis</i>
Least chipmunk	<i>Eutamias minimus</i>
Little brown myotis	<i>Myotis lucifugus</i>
Long-eared myotis	<i>Myotis evotis</i>
Long-legged myotis	<i>Myotis volans</i>
Long-tailed vole	<i>Microtus longicaudus</i>
Long-tailed weasel	<i>Mustela frenata</i>
Marten	<i>Martes americana</i>
Mink	<i>Mustela vison</i>
Montane vole	<i>Microtus montanus</i>
Mountain lion	<i>Felis concolor</i>

\* Nationally Endangered Species

## MAMMALS (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Mule deer	<i>Odocoileus hemionus</i>
Muskrat	<i>Ondatra zibethicus</i>
Northern grasshopper mouse	<i>Onychomys leucogaster</i>
Northern pocket gopher	<i>Thomomys talpoides</i>
Nuttall's cottontail	<i>Sylvilagus nuttalli</i>
Ord's kangaroo rat	<i>Dipodomys ordii</i>
Pallid bat	<i>Antrozous pallidus</i>
Pinon mouse	<i>Peromyscus truei</i>
Porcupine	<i>Erethizon dorsatum</i>
Pronghorn antelope	<i>Antilocapra americana</i>
Raccoon	<i>Procyon lotor</i>
Red fox	<i>Vulpes fulva</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Richardson's ground squirrel	<i>Spermophilus richardsonii</i>
Ringtail	<i>Bassariscus astutus</i>
Rock squirrel	<i>Spermophilus variegatus</i>
Silver-haired bat	<i>Lasionycterus noctivagans</i>
Small-footed myotis	<i>Myotis subulatus</i>
Snowshoe hare	<i>Lepus americanus</i>
Spotted skunk	<i>Spilogale putorius</i>
Striped skunk	<i>Mephitis mephitis</i>
Townsend's big-eared bat	<i>Plecotus townsendii</i>
Uinta chipmunk	<i>Eutamias umorinus</i>
Vagrant shrew	<i>Sorex vagrans</i>
Water shrew	<i>Sorex palustris</i>
Western harvest mouse	<i>Reithrodontomys megalotis</i>
Western pipistrelle	<i>Pipistrellus hesperus</i>
White-tailed antelope squirrel	<i>Ammospermophilus leucurus</i>
White-tailed jack rabbit	<i>Lepus townsendii</i>
White-tailed prairie dog	<i>Cynomys leucurus</i>
Yellow-bellied marmot	<i>Marmota flaviventris</i>

## BIRDS (3)

### Waterfowl

(Anatidae)

#### Common Names

#### Scientific Names

American widgeon or baldpate

*Anas americana*

Blue-winged teal

*Anas discors*

Canada goose

*Branta canadensis*

Cinnamon teal

*Anas cyanoptera*

Gadwall

*Anas strepera*

Green-winged teal

*Anas crecca*

Mallard

*Anas platyrhynchos*

Pintail

*Anas acuta*

Redhead

*Aythya americana*

Shoveler

*Anas clypeata*

Snow goose

*Chen caerulescens*

### Hawks and Eagles

(Accipitridae)

(Falconidae)

Cooper's hawk

*Accipiter cooperii*

Ferruginous hawk

*Buteo regalis*

Golden eagle

*Aquila chrysaetos*

Marsh hawk

*Circus cyaneus*

Northern bald eagle

*Haliaeetus leucocephalus*

Peregrine falcon\*

*Falco peregrinus*

Prairie falcon

*Falco mexicanus*

Red-tailed hawk

*Buteo jamaicensis*

Sharp-shinned hawk

*Accipiter striatus*

Sparrow hawk

*Falco sparverius*

Swainson's hawk

*Buteo swainsoni*

Turkey vulture

*Cathartes aura*

\* Nationally Endangered Species

BIRDS (Cont.)

Owls  
(Strigidae)

Common Name

Scientific Name

Burrowing owl

Speotyto cunicularia

Great-horned owl

Bubo virginianus

Galliformes  
(Phasianidae)

Chukar partridge

Alectoris chukar

Ring-necked pheasant

Phasianus colchicus

Grouse  
(Tetraonidae)

Blue grouse

Dendragapus obscurus

Sage grouse

Centrocercus urophasianus

Turkey  
(Meleagrididae)

Wild turkey

Meleagris gallopavo

Shorebirds  
(Charadriidae)

Killdeer

Charadrius vociferus

Spotted sandpiper

Actitis macularia

BIRDS (Cont.)

Pigeons and Doves  
(Columbidae)

Common Name

Scientific Name

Mourning dove

Zenaidura macroura

Rock dove (domestic pigeon)

Columba livia

Caprimulgiformes  
(Caprimulgidae)

Common nighthawk

Chordeiles minor

Swifts and Hummingbirds  
(Apodidae)  
(Trochilidae)

Black-chinned hummingbird

Archilochus alexandri

Broad-tailed hummingbird

Selasphorus platycercus

White-throated swift

Aeronautes saxatalis

Woodpeckers  
(Picidae)

Downy woodpecker

Dendrocopos pubescens

Hairy woodpecker

Dendrocopos villosus

Red-shafted flicker

Colaptes cafer

Yellow-bellied sapsucker

Sphyrapicus varius

## BIRDS (Cont.)

### Perching Birds

<u>Common Name</u>	<u>Scientific Name</u>
American goldfinch	Spinus tristis
Audubon's warbler	Dendroica auduboni
Barn swallow	Hirundo rustica
Black-billed magpie	Pica pica
Black-capped chickadee	Parus atricapillus
Black-chinned sparrow*	Spizella atrogularis*
Black-headed grosbeak	Pheucticus melanocephalus
Blue-gray gnatcatcher*	Polioptila caerulea*
Blue grosbeak	Guiraca caerulea
Brewer's blackbird	Euphagus cyanocephalus
Brown-headed cowbird	Molothrus ater
Bullock's oriole	Icterus bullockii
Canyon wren	Catherpes mexicanus
Cedar waxwing	Bombycilla cedrorum
Chipping sparrow	Spizella passerina
Common raven	Corvus corax
Common redpoll	Acanthis flammea
Dipper	Cinclus mexicanus
Empidonax flycatcher	Empidonax sp.
Evening grosbeak	Hesperiphona vespertina
Green-tailed towhee	Chlorura chlorura
House finch	Carpodacus mexicanus
House sparrow	Passer domesticus
House wren	Troglodytes aedon
Lark sparrow	Chondestes grammacus
Lazuli bunting	Passerina amoena
Loggerhead shrike	Lanus ludovicianus

## BIRDS (Cont.)

### Perching Birds (Cont.)

<u>Common Name</u>	<u>Scientific Name</u>
Mountain bluebird	<i>Sialia currocoides</i>
Olive-sided flycatcher*	<i>Nuttallornis borealis</i> *
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Plain titmouse	<i>Parus inornatus</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Robin	<i>Turdus migratorius</i>
Rock wren	<i>Salpinctes obsoletus</i>
Rough-winged swallow	<i>Stelgidopteryx ruficollis</i>
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Say's phoebe	<i>Sayornis saya</i>
Song sparrow	<i>Melospiza melodia</i>
Starling	<i>Sturnus vulgaris</i>
Steller's jay	<i>Cyanocitta stelleri</i>
Swainson's thrush	<i>Hylocichla ustulata</i>
Veery	<i>Hylocichla fuscescens</i>
Vesper sparrow	<i>Pooecetes gramineus</i>
Violet-green swallow	<i>Tachycineta thalassina</i>
Virginia's warbler	<i>Vermivora virginiae</i>
Warbling vireo	<i>Vireo gilvus</i>
Western flycatcher	<i>Empidonax difficilis</i>
Western kingbird	<i>Tyrannus verticalis</i>
Western meadowlark	<i>Sturnella neglecta</i>
Western tanager	<i>Piranga ludoviciana</i>
Western wood pewee	<i>Contopus sordidulus</i>
Yellow-breasted chat	<i>Icteria virens</i>
Yellow warbler	<i>Dendroica petechia</i>

\*Identification not positive

## COLD BLOODED ANIMALS (2)

### Amphibians

<u>Common Name</u>	<u>Scientific Name</u>
Great plains toad	<i>Bufo cognatus</i>
Leopard frog	<i>Rana pipiens</i>
Swamp cricket-frog	<i>Pseudacris nigrita</i>
Tiger salamander	<i>Ambystoma tigrinum</i>
Western spadefoot toad	<i>Scaphiopus hammondi</i>
Western toad	<i>Bufo boreas</i>
Woodhouse's toad	<i>Bufo woodhousei</i>

### Reptiles

Bull (gopher) snake	<i>Pituophis catenifer</i>
Collared lizard	<i>Crotaphytus collaris</i>
Common garter snake	<i>Thamnophis sirtalis</i>
Common whipsnake	<i>Masticophis flagellum</i>
Corn snake	<i>Elaphe guttata</i>
Desert striped whipsnake	<i>Masticophis taeniatus</i>
Eastern fence lizard	<i>Sceloporus undulatus</i>
Gopher snake	<i>Pituophis melanoleucus</i>
Leopard lizard	<i>Crotaphytus wislizeni</i>
Midget faded rattlesnake	<i>Crotalus viridis concolor</i>
Milk snake	<i>Lampropeltis triangulum</i>
Sagebrush lizard	<i>Sceloporus graciosus</i>
Short-horned lizard	<i>Phrynosoma douglassi</i>
Side-bloched lizard	<i>Uta stansburiana</i>
Smooth greensnake	<i>Opheodrys vernalis</i>
Spotted night snake	<i>Hypsiglena torquata</i>
Spotted whiptail	<i>Cnemidophorus sacki</i>
Tree lizard	<i>Uta ornata</i>
Western garter snake	<i>Thamnophis elegans</i>
Western whiptail	<i>Cnemidophorus tigris</i>
Yellow-bellied racer	<i>Coluber constrictor</i>

## FISH (4)

<u>Common Name</u>	<u>Scientific Name</u>
Black bullhead	Ictalurus melas
Bluehead sucker	Catostomus discobolus
Bonytail chub**	Gila elegans
Brook trout	Salvelinus fontinalis
Brown trout	Salmo trutta
Carp	Cyprinus carpio
Channel catfish	Ictalurus punctatus
Colorado River cutthroat	Salmo clarki pleuriticus
Colorado squawfish*	Ptychocheilus lucius
Cutthroat trout**	Salmo clarki
Flannelmouth sucker	Catostomus latipinnis
Green sunfish	Lepomis cyanellus
Humpback chub*	Gila cypha
Humpback sucker**	Xyrauchen texanus
Largemouth bass	Micropterus salmoides
Mottled sculpin	Cottus bairdi
Northern pike	Esox lucius
Plains killifish	Fundulus kansae
Rainbow trout	Salmo gairdneri
Red shiner	Notropis lutrensis
Roundtail chub	Gila robusta
Sand shiner	Notropis stramineus
Speckled dace	Rhinichthys osculus
Western white sucker	Catostomus commersoni

\* Nationally Endangered Species

\*\* Colorado Endangered Species

METAZOAN INVERTEBRATES FOUND IN  
PARACHUTE CREEK DRAINAGE (5)

PHYLUM CNIDARIA

Class Hydrozoa

Hydra

PHYLUM PLATYHELMINTHES

Class Turbellaria

Order Rhabdocoela

Order Tricladida

PHYLUM ASCHELMITES

Class Nematoda

Class Rotifera

Rotaria

Cephalodella

Monostyla

Philodina

PHYLUM ANNELIDA

Class Oligochaeta

PHYLUM MOLLUSCA

Class Gastropoda

Physa

Anguispira (Not aquatic)

PHYLUM ARTHROPODA

Class Crustacea

Subclass Ostracoda (ostracods)

Subclass Copepoda (copepods)

Class Insecta

Division Hemimetabola

Order Ephemeroptera (mayflies) (4 species, probably)

Order Plecoptera (stoneflies)

Order Odonata

Suborder Anisoptera (dragonflies)

Order Hemiptera (bugs)

METAZOAN INVERTEBRATES FOUND IN  
PARACHUTE CREEK DRAINAGE

(Cont.)

Division Holometabola

Order Neuroptera (green lacewing adults)

Order Coleoptera (beetles)

Family Haliplidae (crawling water beetles)

Family Hydrophilidae (water scavenger beetles)

Family Staphylinidae (rove beetles)

Family Dytiscidae (predaceous diving beetles)

Family Elmidae (riffle beetles)

Family Chrysomelidae (leaf beetles)

Family Silphidae (carrion beetles)

Order Trichoptera (caddis flies) (at least five species  
based on cases only)

Order Hymenoptera

Family Formicidae (ants) (not aquatic)

Order Diptera

Family Tipulidae (crane flies)

Family Culicidae (mosquitoes)

Family Muscidae (houseflies, horn flies, etc.)

Family Ceratopogonidae (biting midges)

Family Chironomidae (midges)

Family Tabanidae

Chrysops (deerflies)

Family Simuliidae (blackflies)

Family Rhagionidae (snipe flies)

Family Anthomyidae (anthomyid flies)

Family Stratiomyidae (soldier flies)

Class Arachnida

Order Acarina

Family Hydrachnellidae (water mites)

## PROTOZOA FOUND IN PARACHUTE CREEK (5)

### PHYLUM PROTOZOA

#### Subphylum Sarcomastigophora

##### Class Mastigophora (Flagellates)

Chilomonas paramecium

Synura sp.

Chrysomonads

Cryptomonads

Euglena sp.

Peranema trichophorum

##### Class Sarcodina (Amoebae)

Amoeba verrucosa

Amoeba spp. (3 spp.)

#### Subphylum Ciliophora (Ciliates)

Holotrichs, unidentified 7 spp.

Heterotrichs

Colpodid, similar to Colpoda, a trichostome

Paramecium aurelia

Euplotes sp.

Bursaria sp. \*

Epistylis, a peritrich phoretic on plecopteran nymphs.

\* Identification not positive.

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8)

<u>Scientific Name</u>	<u>Common Name</u>
ORDER/Family	
INSECTA	
THYSANURA	
Machilidae	Jumping bristletails
COLLEMBOLA	
Entomobryidae	Springtails
Sminthuridae	Springtails
Isotomidae	Springtails
ORTHOPTERA	
Acrididae	Short-horned grasshoppers
Tettigoniidae	Long-horned grasshoppers
Gryllacrididae	Jerusalem crickets
Gryllidae	Crickets
THYSANOPTERA	
Phloeothripidae	Thrips
HEMIPTERA	
Anthracoridae	Minute psyllid bugs
Miridae	Plant bugs
Nabidae	Damsel bugs
Reduviidae	Assassin bugs
Tingidae	Lace bugs
Lygaeidae	Seed bugs
Coreidae	Leaf-footed bugs
Pentatomidae	Stink bugs
Aradidae	Flat bugs

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
HOMOPTERA	
Cicadellidae	Leafhoppers
Psyllidae	Psyllids
Aphididae	Aphids
Chermidae	Jumping plant lice
Coccoidea <sup>1</sup>	Scale insects
Fulgoridae	Fulgorid planthoppers
Eriosomatidae	Gall-making aphids
Delphacidae	Delphacid planthoppers
COLEOPTERA	
Carabidae	Ground beetles
Silphidae	Carrion beetles
Lampyridae	Lightning bugs
Dermestidae	Dermestid beetles
Malachiidae	Soft-winged flower beetles
Cleridae	Checkered beetles
Buprestidae	Metallic wood-boring beetles
Coccinellidae	Ladybird beetles
Anthicidae	Antlike flower beetles
Tenebrionidae	Darkling beetles
Bostrichidae	Branch and twig borers
Scarabaeidae	Scarab beetles
Chrysomelidae	Leaf beetles
Curculionidae	Snout beetles
Histeridae	Hister beetles
Elateridae	Click beetles
Throscidae	Pseudo-click beetles
Pedilidae	Pedilid beetles
Scolytidae	Bark beetles

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
COLEOPTERA (Cont.)	
Staphylinidae	Rove beetles
Scydmaenidae	Antlike stone beetles
Cantharidae	Soldier beetles
Ostomidae	Bark-gnawing beetles
Erotylidae	Pleasing fungus beetles
Lathridiidae	Minute brown scavenger beetles
Meloidae	Blister beetles
Melandryidae	False darkling beetles
Ptinidae	Spider beetles
Anobiidae	Drugstore and death-watch beetles
Byrrhidae	Pill beetles
NEUROPTERA	
Coniopterygidae	Dusty-wings
Chrysopidae	Green lacewings
Hemerobiidae	Brown lacewings
Myrmeleontidae <sup>1</sup>	Ant lions
Raphidiidae	Snakeflies
LEPIDOPTERA	
Arctiidae	Tiger moths
Geometridae	Measuringworms
Microlepidoptera <sup>2</sup>	Unidentified adult Microlepidopterans
Pyralidae	Snout moths
Noctuidae	Noctuid moths
Lasiocampidae	Tent caterpillars
Pterophoridae	Plume moths
Tortricidae	Leaf-roller moths

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
LEPIDOPTERA (Cont.)	
Incurvariidae	Incurvarid moths
Hesperiidae	Skippers
DIPTERA	
Sciardae	Dark-winged fungus gnats
Asilidae	Robber flies
Phoridae	Humpbacked flies
Tephritidae	Fruit flies
Milichiidae	Milichiid flies
Chloropidae	Chloropid flies
Calliphoridae	Blow flies
Cecidomyiidae	Gall midges
Dolichopodidae	Long-legged flies
Syrphidae	Syrphid flies
Tipulidae	Crane flies
Psycholidae	Moth flies
Chironomidae	Midges
Simuliidae	Black flies
Bibionidae	March flies
Mycetophilidae	Fungus gnats
Therevidae	Stiletto flies
Empididae	Dance flies
Pipunculidae	Big-headed flies
Otitidae	Picture-winged flies
Sepsidae	Black scavenger flies
Sciomyzidae	Marsh flies
Chamaemyiidae	Aphid flies

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
DIPTERA (Cont.)	
Lonchaeidae	Lonchaeid flies
Heleomyzidae	Heleomyzid flies
Trixiscelididae	Trixoscelid flies
Agromyzidae	Leaf-Miner flies
Anthomyiidae	Anthomyiid flies
Muscidae	Muscid flies
Tachinidae	Tachinid flies
SIPHONAPTERA	
	Fleas
HYMENOPTERA	
Ichneumonidae	Ichneumonid wasps
Cynipidae	Gall wasps
Mutillidae	Velvet ants
Formicidae	Ants
Pompilidae	Spider wasps
Sphecidae	Sphicid wasps
Xiphydriidae	Wood wasps
Braconidae	Braconid wasps
Chalcidoidae <sup>1</sup>	Chalcid wasps
Platygasteridae	Platygasterids
Tenthredinidae	Typical sawflies
Mymaridae	Fairyflies
Eulophidae	Eulophids
Encyrtidae	Encyrtids
Eupelmidae	Eupelmids
Pteromalidae	Pteromalids
Figitidae	Figitids
Proctotrupidae	Proctotrupids

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
HYMENOPTERA (Cont.)	
Diapriidae	Diapriids
Scelionidae	Scelionids
Bethylidae	Bethylids
Dryinidae	Dryinids
Vespidae	Paper wasps
Colletidae	Plasterer and yellow-faced bees
Audrenidae	Mining bees
Halictidae	Mining bees
Megachilidae	Leafcutting bees
Apidae	Bumble and Honey bees
ARACHNIDA	
ACARINA	Mites
ARANEIDA	
Dictynidae	Dictynid spiders
Pholcidae	Long-legged spiders
Lycosidae	Wolf spiders
Oxyopidae	Lynx spiders
Gnaphosidae	Hunting spiders
Clubionidae	Two-clawed hunting spiders
Thomisidae	Crab spiders
Salticidae	Jumping spiders
Theridiidae	Cobweb spiders
Microphantidae	Dwarf spiders
Araneidae	Orb-weavers
Hahniidae	Hahniid spiders

ARTHROPODS FOUND ON THE  
ROAN PLATEAU (6) (7) (8) (Cont.)

<u>Scientific Name</u>	<u>Common Name</u>
CHELIPODA	
CEOPHILOMIRPHA	Centipedes
PHALANGIIDAE	
Phalangiidae	Daddy-longleggs
PSOCOPTERA	
Trogiidae	Psocids
SCORPIONIDA	Scorpions
CHELONETHIDA	Pseudo scorpions
SOLPUGIDA	Wind-scorpions
PHALANGIDA	Daddy-longlegs
ACARI	Mites and ticks
GEOPHILOMORPHA	Centipedes

1 Superfamily

2 Division

REFERENCES:

- (1) Colony, Environmental Impact Analysis for a Shale Oil Complex at Parachute Creek, Colorado, Appendix 1, 1974.
- (2) Colony, EIA, Appendix 2.
- (3) Colony, EIA, Appendix 10.
- (4) Personal communication with Colorado Division of Wildlife.
- (5) Colony, EIA, Appendix 9.
- (6) C-b Shale Oil Project (Shell Oil Company, Operator), Quarterly Data Report #4, October 15, 1975.
- (7) C-b Shale Oil Project (Shell Oil Company, Operator), Quarterly Data Report #5, January 15, 1976.
- (8) Rio Blanco Oil Shale Project (Gulf Oil Corp and Standard Oil Co), Progress Report 4 - Summary, October 31, 1975.



## APPENDIX 5



## Appendix 5

### Features of the Plan

The total acreage included within the Battlement Mesa Planned Unit Development is 3,010 acres, divided into ten land use types, namely six residential categories, one neighborhood commercial area, one principal office park area, a town center, and combined public, semi-public and recreation uses. Development is expected to occur in three five-year increments, described as Phases I, II, and III.

The six residential areas are located within neighborhood units with the higher density residential areas toward the center of the community within easy walking range of the town center, office park, and central recreational areas. In addition, the higher density residential areas will have direct access to the principal arterial street loop system. Development within all residential areas for the PUD will not exceed 7,100 permanent dwelling units, or an overall gross density of 2.36 dwelling units per acre.

One small neighborhood commercial area is proposed in the north central portion of the Planned Unit Development close to the office park area and close to two proposed neighborhoods which are somewhat removed from the town center area.

The office park area is designed to permit basic employment uses which may wish to locate in this portion of Garfield county. Nearness to the arterial street system and to the town center enhance the office park potential.

The town center of approximately 64.0 acres, situated in the center of the PUD and adjacent to the arterial street system, will provide sufficient space for major shopping facilities and adjacent office, motel/hotel, and related service uses. Plans for the town center will be integrated to include attractive pedestrian ways, adequate parking, and architectural control.

The public, semi-public and recreation area totals 1,193.8 acres, just slightly less than 40% of the total area of the Planned Unit Development. Within this classification, 100 acres will be reserved for one senior high school, two junior high school tracts, and six elementary school sites. Six church locations, a community center parcel, and adequate space for an 18-hole golf course are included. In addition, approximately 729 of the 1,193.8 acres will be preserved primarily in their natural state. Within the public, semi-public and recreation area, slightly less than 4% will be devoted to arterial road rights-of-way and the sewage treatment plant site.

The arterial highway system illustrated on the Planned Unit Development map attached hereto as Exhibit B serves primary traffic generators within the PUD. Collector street systems and local systems will be added at the time of platting. Separate pedestrian rights-of-way will also be established throughout the public, semi-public and recreation areas to join residential tracts to primary public and recreation centers as well as, where possible, to shopping facilities and nearby neighborhoods.

# Land Uses and Development Standards

The proposed division of the subject lands is as follows:

<u>Land Use Type</u>	<u>Land Use Symbol</u>	<u>Number of Dwellings Units and Acreage</u>			<u>Total Acreage Within Each Land Use Type</u>
		Phase I	Phase II	Phase III	
Rural Density Residential	RDR	14-45 d.u. 45.3 ac.	19-63 d.u. 63.2 ac.	144-482 d.u. 482.3 ac.	590.8 ac.
Low Density Residential	LDR	141-705 d.u. 141.0 ac.	199-997 d.u. 199.4 ac.	410-2052 d.u. 410.4 ac.	750.8 ac.
Medium Density Residential	MDR	533-1280 d.u. 106.7 ac.	318-763 d.u. 63.6 ac.	96-230 d.u. 19.2 ac.	189.5 ac.
Central Area Residential	CAR		552-920 d.u. 46.0 ac.		46.0 ac.
Provisional Residential	PR	240-577 d.u. 48.1 ac.			48.1 ac.
Mobile Home Residential	MHR	435-783 87.0 ac.			87.0 ac.
Neighborhood Commercial	NC		8.0 ac.		8.0 ac.
Office Park	OP		32.0 ac.		32.0 ac.
Town Center	TC	19.0 ac.	80 d.u. 45.0 ac.		64.0 ac.
Public, Semi-Public and Recreation	PSR	404.9 ac.	588.8 ac.	200.1 ac.	1,193.8 ac.
Totals		1363-3390 d.u. 852 acres	1168-2823 d.u. 1,046 acres	650-2764 d.u. 1,112 acres	7,100 d.u. 3,010 acres



APPENDIX 6  
COMMENT LETTERS  
IN CHRONOLOGICAL ORDER



Advisory Council  
On Historic Preservation

1522 K Street N.W.  
Washington, D.C. 20005

Page 2

December 29, 1975  
Mr. Dale R. Andrus  
Oil Shale Resources (Colony Development Operation)

December 29, 1975

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Colorado State Office  
Room 700, Colorado State Bank  
Building  
1600 Broadway  
Denver, Colorado 80202

Sincerely yours,



Louis S. Wall  
Assistant Director, Office  
of Review and Compliance

P. O. Box 25085, Denver, Colorado 80225, telephone number (303) 234-4946.

Dear Mr. Andrus:

This is in response to your request of December 16, 1975 for comments on the environmental statement for Proposed Development of Oil Shale Resources by The Colony Development Operation in Colorado and Utah. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate. However, we wish to remind the Bureau of Land Management (BLM) that if alternative power line corridors over the Naval Oil Shale Reserve will affect archeological sites or if archeological sites are discovered during construction then the BLM should: (1). in consultation with the appropriate State Historic Preservation Officer determine the eligibility of each affected cultural resource for inclusion in the National Register of Historic Places; and, (2). afford the Advisory Council an opportunity to comment on the undertaking in accordance with the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800) if the cultural resource is determined eligible for the National Register.

Should you have any questions or require any additional assistance, please contact Brit Allan Storey of the Advisory Council staff at

*The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.*

Advisory Council  
On Historic Preservation

1522 K Street N.W.  
Washington, D.C. 20005

January 13, 1976

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Colorado State Office  
Room 700, Colorado State Bank  
Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

By letter of December 29, 1975, the Advisory Council responded to your request for comments on the draft environmental statement (DES) for the Proposed Development of Oil Shale Resources by The Colony Development Operation in Colorado and Utah. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA), the Advisory Council on Historic Preservation at that time stated that it had determined that the DES appeared procedurally adequate and reminded the Bureau of Land Management of certain responsibilities which it should exercise if unknown sites were affected or if sites on Naval Oil Shale Reserves would be affected.

John S. H. Smith, staff to the Utah State Historic Preservation Officer, by letter of December 30, 1975, notified the Advisory Council of factors relating to the information provided in the DES which could affect the Advisory Council's judgement as to the adequacy of the DES. Copies of all of the material received from Mr. Smith are enclosed for your convenience. Because this information makes it doubtful that the Council could continue its position as stated in its letter of December 29, 1975, the Council requests a report: (1) on the qualifications of Lawrence Royer to conduct an archeological survey; (2) on the field techniques used by Mr. Royer to conduct the archeological surveys in Grand and San Juan counties, Utah; and, (3) on whether Mr. Royer's activities extended into any portion of Colorado.

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

#-02

Page 2  
January 13, 1976  
Mr. Dale R. Andrus  
Oil Shale Resources (Colony Development Operation)

Under the circumstances, the Council must consider its comments of December 29, 1975, pursuant to Section 102(2)(C) of NEPA to be invalidated until such time as these matters are satisfactorily resolved.

Your prompt attention to this matter should result in expeditious handling and allow an early resolution of the problems involved.

Sincerely yours,

*Michael A. Buerge*  
Louis S. Wall  
Assistant Director, Office  
of Review and Compliance

Enclosures

cc: Dr. Clement M. Silvestro, Chairman, ACHP  
Mr. Stephen H. Hart, CO:SHPO  
Dr. Melvin T. Smith, UT:SHPO  
Mr. Douglas Wheeler, DOI:FLO

#-03



STATE OF UTAH  
Cabin L. Rampton, Governor

DEPARTMENT OF  
DEVELOPMENT SERVICES

Division of State History

Melvin T. Smith, Director  
603 East South Temple  
Salt Lake City, Utah 84102  
Telephone: (801) 328-5755

December 30, 1975

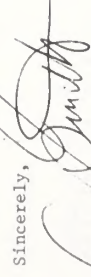
Dale R. Andrus  
State Director  
United States Department of the Interior  
Bureau of Land Management  
Colorado State Office  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

I am replying to you on behalf of the State Historic Preservation Officer for Utah, with reference to the draft environmental impact statement on oil shale resource development by the Colony Development Operation in Colorado.

Our concern centers on the cultural resources portion of the statement that purports to deal with the pipeline that will be constructed within Grand and San Juan Counties of Utah. The State Historic Preservation Officer, in consultation with the State Archeologist, has determined that the treatment of cultural values does not fully comply with the Historic Preservation Act of 1966, Executive Order 11593, or the Advisory Council on Historic Preservation's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800). Specifically, there is no indication that thorough historic and archeological surveys were conducted by known professionals over the length of the proposed pipeline in the two Utah counties. The State Archeologist requests the opportunity to examine and comment on the official archeological survey report by one Lawrence Royer, the "Utah Environmental and Agricultural Consultant."

Sincerely,

  
John S.H. Smith  
Preservation Planning Specialist

JSHS:clw

cc: Burton Carlson  
State Planning Coordinator

#-04

F. M. S T E V E N S O N  
1200 SECURITY LIFE BUILDING  
DENVER, COLORADO 80202

JAN 26 AM 10:40

January 22, 1976

U.S. Department of Interior, BLM  
700 Colorado State Bank Building  
Denver, CO 80202

Attn: Mr. Dale R. Andrus, State Director

Re: Environment Impact Statement-Colony  
Development Operation

Gentlemen:

First, let me compliment those who prepared this impact statement as it is most complete and the project has been thoroughly investigated. However, in my estimation, essentially the same route would have been chosen, equivalent engineering would have been done, and the end results will be comparative without the expenditure of the several hundred thousand dollars this statement must have cost. The added costs which must eventually be passed on to all consumers of energy products just cannot be justified to this extent.

My study and comments on the impact statement are entirely confined to the pipeline project through BLM lands in the State of Colorado.

Minimum environmental impact in moving large quantities of oil is best achieved by the pipeline method. Possible operational impacts (spills, etc.) are minimized by the route selected.

The study points out that disturbing surface and plant life along the route during construction could affect runoff thus increasing erosion and suspended solids in streams. Due to the very low rainfall in the area, the probabilities of any significant damage are almost nonexistent. No long-term declared damage to wild life, fish or birds is found by the study. Short-term dislocations are of no significance.

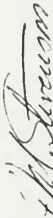
U.S. Department of Interior, BLM  
January 22, 1976  
Page 2

04

It should be noted that not only are there fully adequate contingency response plans for cleaning up any possible oil spills but spill prevention plans have been fully investigated and incorporated in the line design.

In view of the above facts, it is recommended by the writer that this project be approved by the BLM as submitted.

Sincerely,



F. M. Stevenson, Member Colorado  
Multiple Land Use Advisory Board

FMS:nh

#-05

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

P. O. Box 17107, Denver, Colorado 80217

JAN 27 1976

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

We have reviewed the draft environmental impact statement for the proposed development of oil shale resources by the Colony Development Operation in Colorado.

The environmental statement is well written and covers the expected impacts quite well.

We do have the following comments:

1. It is not clear why only 200 acres of the 800 acres covered by the processed shale disposal and Davis Gulch Catchment Dam will be stockpiled and respread on the surface. Apparently, the remaining 600 acres of topsoil will not be utilized.
2. There do not seem to be sufficient provisions for controlling erosion during construction.

We appreciate the opportunity to review and comment on this proposal.

Sincerely,

*Diane L. Lister*

M. D. Burdick  
State Conservationist Acting

cc: Council on Environmental Quality (5 copies)

K. L. Williams, Director, WTSC

R. M. Davis, Administrator, SCS

Fowden Maxwell, Office of the Secretary, USDA



#-06

DEPT. OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
COLORADO SPRINGS, COLORADO

910

76 FEB 2 AM 10:00 4th Avenue, North  
Great Falls, Montana 59401

Dale R. Andrus  
State Director  
Bureau of Land Management  
Rm. 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

January 29, 1976

Dear Mr. Andrus:

I have reviewed DES 75-62 concerning the proposed oil shale development and find its impacts totally unacceptable. In my opinion, the only rational action is one of 'no action' and I actively support your adoption of such an alternative relative to the proposed development. Other alternatives are available and less costly, both from an economic and an ecological viewpoint. I urge you not to submit to administration policies of rape for the western states. Do not approve this project.

Sincerely,

*Thomas E. Horobik*  
Thomas E. Horobik



COLORADO DEPARTMENT OF HEALTH

4210 EAST 11TH AVENUE - DENVER, COLORADO 80220 - PHONE 388-6111  
Edward G. Dreyfus, M.D., M.P.H., Executive Director

February 2, 1976

Mr. Dale R. Andrus, State Director  
U. S. Department of the Interior  
Bureau of Land Management  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Re: DES-75-62

Dear Sir:

The above mentioned document has been received and carefully reviewed by Department personnel. The following comments are submitted for your review:

Any mining and rock crushing operation is noisy. Measurements made during the operation of the semiworks plant indicate that this facility will be no different. (74-117 dBA in the mine, 72-111 dBA at the crushing plant). Due to the fairly isolated location of the plant, this will have little impact on off-site personnel except for hunters, hikers, and fishermen.

The reflection of noise off the canyon walls, adding to the anticipated noise levels of the plant, add to the undesirability of locating the plant at the canyon bottom site. Noise and vibration would add to the probability of rock slides.

The Grand Valley Grammar School is located along the road from U.S. 6 to Colony. It may be advisable to reroute the main road around the town. Any widening of the existing road will involve moving or destroying some existing homes. Construction of I-70 is resulting in some condemnation proceedings already, and it is believed that there is a limit of such activities to which a community should be subjected.

The report notes that the traffic between Grand Valley (soon to be renamed Parachute) and the Colony site will affect only about twelve families along the road. We estimate that the population density along the road, will increase as the project proceeds. Probably many of the newcomers will be housed in mobile homes on sites near the road. Traffic noise will be amplified by the steep walls of the valley. The effect on valley residence has been acknowledged on page IV-16.

#-07

Mr. Dale R. Andrus  
February 2, 1976  
2

07

The document was found to adequately address the air quality impact of the proposed project. The most probable infringement on both the sulfur dioxide and the particulate ambient air quality standards will occur when winds drain into Parachute Creek Valley from atop the plateau. This will have the effect of adding the plateau-based emissions to the valley-based emissions causing ambient concentrations to rise above standards.

There is a naturally high ambient background for hydrocarbons already in existence. Any additional emissions of this pollutant will exasperate violations of this standard.

An appropriate control plan should be implemented to reduce the impact from fugitive dust emissions during construction. Air Pollution Control Commission Regulation No. 1 should be reviewed for applicability to this project regarding fugitive dust.

Thank you for your cooperation in this matter.

Yours truly,

A. C. Bishard, P.E., Chief  
Stationary Sources Section  
Air Pollution Control Division

#-08

08



# THE STATE HISTORICAL SOCIETY OF COLORADO

Colorado State Museum, 200 Fourteenth Avenue, Denver 80203  
February 2, 1976

Mr. Dale Andrus  
State Director  
Bureau of Land Management  
Colorado State Office  
Room 700  
Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

RE: Proposed Development of Oil Shale Resources by the  
Colony Development Operations in Colorado and Utah

Dear Mr. Andrus:

We have reviewed your statement sent to us the 29th of December. We feel that several points of interest to this office need to be addressed.

The proposed pipeline does cross the Dominguez-Escalante Trail at the approximate juncture of the Rio Blanco and Garfield county lines. Therefore, there will be an impact upon this trail. The Dominguez-Escalante Route is eligible for nomination as a National Register Trail and a Governor's Commission is working with this.

The pipeline also crosses the Old Uintah Railroad grade at West Salt Creek. This railroad grade, with its definite historical significance, may also be eligible for National Register nomination and would be impacted by the pipeline, which we earlier determined would be neither permanent nor adverse as designed. (Letter, December 4, 1974).

The State of Colorado's inventory of historic and archaeological sites is an ongoing project and work in Garfield and Rio Blanco counties is not complete. A complete inventory of the project area by a qualified historian and an archaeologist is necessary before a realistic assessment of impacts can be made, and certainly prior to any clearance by this office. This inventory should include photographic records of historical sites and structures and all historic research data available. The information supplied by a complete inventory is invaluable in determining impacts to the region by such a large and complex undertaking as the Colony Development Operation.

Mr. Dale Andrus  
Page 2

We will be unable to grant clearance for this project until a complete inventory is submitted and studies and further clarification of mitigating measures is given for those portions of the Uintah Railroad and the Dominguez-Escalante Trail which cross the pipeline. Furthermore, federal ownership of lands is not the criteria for the applicability of the federal acts. I refer you to the National Historic Preservation Act of 1966, Sections 104 and 106; Executive Order 11593, Section 2(b)(c); 36 CFR part II Number 79, Section I, 3(2), 5(a), 38 CFR Number 84 Section 2, 3(a)(b), 5, 6, 8(a)(i); and 36 CFR part 800 itself. Any federal participation requiring an impact study requires adequate study of the resources in the area. Obviously this includes their identification. Therefore, I am afraid you will have to provide for a survey of the cultural resources for the plant site, service corridor, staging area, new town, and shale disposal area. We look forward to working with you on this, as well as on the matter of the eligible National Register sites already identified.

Sincerely,

*Cynthia Emrick*

Cynthia Emrick  
Preservation Assistant  
State Historic Preservation Office

cc: Advisory Council  
Council of Environmental Quality

A-6-8

#-09

# Frank M. Walton League of America, Inc.



PROTECTION OF SOILS, WOODS, WATERS AND WILDLIFE

## COLORADO DIVISION

2411 Newton Street

Westminster Colorado 80030 February 5, 1976

Mr. Dale A. Andrus, State Director  
Bureau of Land Management,  
Denver Colorado 80203  
Re: Colony oil shale resource  
development-19 1/2 mile pipe-  
line right-of-way.  
DES 75-52.

Dear Sir:

On January 24, 1976 our Board of Directors voted to take the following position on the above matter.

1. We oppose granting the right-of-way permit and call attention to an acceptable alternate of an existing rail facility, well able to handle this movement as detailed in DES.
2. We favor rail transportation which is clearly shown as an acceptable alternate in DES, section IX, pages 28, 29 and 30. Further, the Rand analysis in table IX-3, column A and the rail-truck comparison in table IX-4 are all extremely favorable to the rail mode. Also the DWRGM state they can handle this traffic by unit train with their presently existing facilities.
3. DES refers to truck transportation from plant to rail head (15 miles) if rail transportation is used. This, in our opinion is undesirable and unnecessary from both an economic and environmental standpoint. It seems obvious that a short 15 mile pipeline from plant to rail rail head would be acceptable and an advantage for these reasons:
  - a. Such 15 mile down hill pipeline would be on private property already owned by the developers.
  - b. The developers already have a proposal pending to build two pipelines down the valley corridor (one for ammonia and one for sulphur). Another pipeline to a tank farm from which the rail cars would be loaded, should be no material problem.
  - c. Air quality in the narrow valley corridor already in heavy use, would be further adversely affected by such heavy truck traffic but not by a third pipeline (with two others) this short distance.

I would like to offer a suggestion of my own. That is for BLM, in view of the obvious delay (perhaps years) in commercial development, to set all possible development people and equipment off of unleased public land and allow this frail ecosystem to rest for awhile. Please recall, Secretary Kleppe personally stated (at the Jan 26 Denver meeting) "oil shale has a low priority". Colony has suspended operations, Paraho is ready to shut down, the action has moved to Utah. Could we not give this area an opportunity to recover, pending actual commercial development.

Thanking you for the opportunity to comment, I am,

Yours very truly,

*Dick Halley*  
President, Colorado Division

Mr. Dale R. Andrus  
February 5, 1976  
Page 2

1664 South Chase Court  
Lakewood, Colorado 80226  
February 5, 1976

Mr. Dale R. Andrus  
State Director, Bureau of Land Management  
Colorado State Office  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

I would like to make the following comments on the Colony EIS. I am making these comments on my own behalf as a Registered Professional Engineer in the State of Colorado and a former resident of Western Colorado.

In Table IV-1, page IV-2, the impact of shale oil production on energy supply is classified as negligible. I strongly suggest that this be changed to "moderate" for the following reasons.

Shale oil production at 47,000 barrels per day represents roughly 10% of the total petroleum refinery input in the Rocky Mountain States (Ref. The Oil and Gas Journal API Refinery Report) and 1% of the total foreign crude imports into the U.S. Also, operation of a single, full-scale commercial oil shale plant represents available technology for recovering about 80 billion of the 600 billion barrels of crude oil equivalent in the Green River Formation (Draft EIS, page III-16).

The Draft EIS adequately covers the raw data concerning socio-economic conditions in Mesa, Garfield, and Rio Blanco counties, but underestimates the potential benefit of major industrial development in this area. Out-migration of residents in the 19-29 year age bracket, higher than State average percentages of population on welfare, lower wage rates, and higher unemployment all point to an undesirable situation.

From my own personal experience and contacts in Western Colorado, I am convinced that most residents support oil shale development if done properly. I believe the final EIS should more positively express the beneficial socio-economic factors and should note that there is local support for the Colony project.

Finally, I commend the BLM on an excellent job and urge you to continue your work on preparing and issuing the final EIS.

Very truly yours,

*L. L. Ludlam*

L. L. Ludlam, P.E.

LIL:rlh

# - ||

"The original of this letter is handwritten;  
it was typed for clarity prior to reproduction here."

February 10, 1976

Dear Sir,

I would like to comment on the Draft EIS for the proposed Development of Oil Shale Resources by Colony Development Operation.

I support the "Moab Alternative" as the final route for the Pipeline. There is no reason to disturb additional areas if the pipeline can be built on, or adjacent to, existing highway and pipeline rights-of-way. In addition, I don't feel an adequate archeological survey of the proposed pipeline route has been made. By following the "Moab Alternative," there is less chance of disturbing archeological sites.

Sincerely,  
(sgd) Owen Severance  
P.O. Box 460  
Moab, Utah 84532



IDAHO CHEMICAL PROGRAMS - OPERATIONS OFFICE

550 Second Street

Idaho Falls, Idaho 83401

#-12

Mr. Frank Leare  
Wiel-2-76  
Page 2

12

mental impact statement.

February 6, 1976

Comment on Draft Environmental  
Statement - Colony Development Operation  
Wiel-2-76

Very truly yours,

JAW/pe

*J. A. Wielang*

J. A. Wielang  
Principal Nuclear Material  
Accountability Agent  
Process Support and Technology  
Branch

Ref: CO-912 1792 FC01 December 16, 1975

Mr. Frank Leare  
United States Department of the Interior  
Bureau of Land Management  
Colorado State Office  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Leare:

I have reviewed the draft environmental statement for the proposed development of oil shale by The Colony Development Operation in Colorado.

The draft environmental statement was very well prepared and contains sufficient information in most areas to evaluate the environmental impact. I am of the opinion that a 60-day review period does not provide sufficient time to fully check the technical and reference data.

I am in agreement with the development of the oil shale reserves in Colorado if it can be firmly proven that it is economical and the energy gained is of sufficient magnitude. From review of the draft environmental statement, I felt neither of these criteria would be satisfied.

Would it be possible for me to receive estimates on the energy required to produce the shale oil (including automobiles, homes, lights, etc., both to produce and operate for the plant and their personnel) vs. the energy contained in the shale oil produced?

I would suggest where the oil pipeline crosses streams that the pipeline be doubley contained (i.e. a pipe inside a pipe) and be constructed on each stream bank to contain the maximum expected oil spill.

Another area I question is the availability of process and potable water as my information is that all the Colorado river drainage water has been duly filed (patent) and therefore not available.

More data should be compiled on the phenols and radioactive emissions. It would appear that with the shale oil pilot-plant units in operation along with laboratory studies, actual calculations could be made on actual discharges with limits of error given rather than postulated calculations.

Emissions from the facilities, homes, automobiles, etc. in Grand Valley and Battlement Mesa areas should be determined and included in the environ-



DEPARTMENT OF THE ARMY  
SACRAMENTO DISTRICT, CORPS OF ENGINEERS  
680 CAPITOL MALL  
SACRAMENTO, CALIFORNIA 95814

REPLY TO  
ATTENTION OF  
SPKED-W

13 AM 10:00

#-13

10 February 1976

Mr. Dale R. Andrus  
State Director  
US Department of the Interior  
Bureau of Land Management  
1600 Broadway, Room 700  
Denver, CO 80202

Dear Mr. Andrus:

This is in response to your letter of 16 December 1975 addressed to the Office of the Chief of Engineers requesting review of the draft environmental statement (EIS) for the proposed development of oil shale resources by the Colony Development Operation in Colorado.

We have reviewed the statement, and the proposed work will not conflict with flood control or other programs within our jurisdiction. However, we have the following comments:

- a. The pumping stations for water from Parachute Creek and Colorado River should be sited to avoid damage from floodflows.
- b. Backfill over pipelines at stream and drainage channel crossings should be protected with riprap to prevent future erosion.
- c. As indicated in the EIS, Department of the Army permits will be required where construction involves placing fill material or dredged materials in waterways of the United States. Under the expanded jurisdiction of Section 404 of Public Law 92-500, the requirement for Department of the Army permits for the following activities, and the impact of these activities, should be discussed in the EIS:

- (1) Placing of fill in any streams with a normal flow of at least 5 cubic feet per second or their adjacent wetlands during construction of the pipeline, particularly the crossing of marshland between the Colorado River and Moab.

SPKED-W  
Mr. Dale R. Andrus

10 February 1976

(2) Placing of fill in Parachute Creek or its adjacent wetlands during the development of the service corridor in Parachute Creek Valley.

(3) Construction of the Davis Gulch Dam and Middle Fork Dam.

Thank you for the opportunity to review the environmental statement.

Sincerely yours,

GEORGE C. WEDDELL  
Chief, Engineering Division

Colony Development Operation  
1500 Security Life Building  
Denver, Colorado 80202  
Telephone 303 266 3741

Hollis M. Dole  
General Manager



#-14

February 12, 1976

State Director  
Bureau of Land Management  
Room 700  
Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Re: Draft Environmental Impact Statement  
Proposed Development of Oil Shale  
Resources by The Colony Development  
Operation in Colorado

Dear Sir:

In accordance with the Notice of Availability of Draft Environmental Impact Statement published in the Federal Register on December 16, 1975, Colony Development Operation submits the following written comments on the draft statement referred to above:

1. The statements made by Lloyd C. Foy (on behalf of La Sal Pipe Line Company), R. E. Huff (on behalf of Battlement Mesa, Inc.), D. K. McSparran and D. C. Varisco (on behalf of Atlantic Richfield Company) and H. M. Dole (on behalf of Colony) during the hearings of January 27-29, 1976, are incorporated herein by reference. This letter includes the written comments of each of these individuals.
2. Summary Sheet, page i, paragraph 2: As soon as possible after the completion of the draft statement, representatives of Colony intend to negotiate the final terms of a contract with the Bureau of Reclamation providing for the release of up to 1000 acre feet per year of water for use in the community which Colony currently hopes to build on Battlement Mesa to accommodate project employees and other

Letter to: State Director  
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persons drawn to the area by the proposed complex. The Bureau of Reclamation has taken the position that negotiations cannot proceed further until the statement has been completed. An analysis of the impacts of the execution of this contract adequate to satisfy the requirements of the National Environmental Policy Act (NEPA) should be included in the final statement.

The word "Corporation" in the next to last line of paragraph 2 should be changed to "Operation."

The words "12.5 cubic feet per second" in the next to last line of paragraph 2 should be revised to read "up to 7200 acre feet per year."

3. Summary Sheet, page ii, ninth line from bottom: The word "contract" should be changed to read "contracts."

4. Table of Contents, page ix, tenth line: The title "Land Use Plan, Policy, and Control" should be revised to read "Land Use Plans, Policies, and Controls."

5. Table of Contents, page xii, tenth line: The title "Green Mountain Reservoir" should be revised to read "Green Mountain and Ruedi Reservoirs."

6. Page I-2, Figure I-1: A second arrow from the circled four should be drawn pointing to the Ruedi Reservoir.

7. Page I-3, third line: The word "contract" should be changed to read "contracts" and the word "a" should be deleted.

8. Page I-3, fourth line: The words "Green Mountain Reservoir" should be changed to read "Green Mountain and Ruedi Reservoirs."

9. Page I-3, line 12: The following sentence should be added after the sentence ending "Program, 1973."

This regional analysis has been supplemented with the information set forth on pages II-99 through II-110 hereof.

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10. Page 1-3: To the extent that NPDES permits will be required during hydrostatic testing of the pipeline, they should be mentioned here and on page II-7.
11. Page 1-3, last sentence: This sentence should be clarified to eliminate any suggestion that Colony is uncertain about the capacity of the plant complex or the retrofitting technology to be incorporated in the proposed design of the plant.
12. Page II-3, Figure II-2: As indicated in Mr. Foy's statement, La Sal Pipe Line Company has filed an amendment to the original right-of-way application which changes the alignment in the immediate vicinity of the Dow West property. All figures which show the right-of-way location should be revised, as appropriate, to reflect this change.
13. Page II-5, eleventh line: The words "up to 7200 acre feet per year" should be substituted for the words "12.5 cubic feet per second."
14. Page II-5, twelfth line: Substitute the following sentence for the sentence beginning "This diversion is":  
This contract will provide a source of water during low flow periods in the Colorado River when Colony's private water rights are insufficient to meet plant requirements.
15. Page II-5, second full paragraph: Appropriate reference should be made to the contract for water from the Ruedi Reservoir.
16. Page II-7, fifth line: Add reference to Ruedi Reservoir.
17. Page II-16, eleventh line: The words "are estimated to" should be substituted for the word "will."
18. Page II-16, fifth line from bottom: The total emission rate of 20.4 Kgm/hr for particulates includes emissions from the mine vents and the

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19. Page II-17, second paragraph, second line: Insert "and scheduled turnarounds" after the word "interruptions."
20. Page II-17, last line: Insert "dust collection system" after the word "crusher." Substitute "from 3 to 4 kgm/hr." for "3.6 kgm/hr."
21. Page II-17: Add the following new last sentence:  
An estimate of the additional volume of fugitive dust which could be generated at the primary crusher is included in the particulate emission rate set forth on page II-16.
22. Page II-18, Figure II-9: Stack emission rate should be revised to read 3.3 kgm/hr.
23. Page II-20, Table II-2: Particulate emission rate is not consistent with Colony's latest estimate (7.2 lb./hr). Total stack emission rate should read "62,100 acf/min."
24. Page II-20, Table II-3: Center column should be retitled "Transfer Tower Feed Bin Dust Control System." Particulate emission rates are not consistent with Colony's latest estimates (0.5, 5.0, and 5.6 lb./hr., respectively). Portal transfer point stack exit diameter should be 1.6 feet. Figures adjacent to "Total Stack Gases" should read "53,100 acf/min.," "43,800 acf/min.," and "48,000 acf/min."
25. Page II-22, Table II-4: Figures adjacent to "Total Stack Gases" should read "72,000 acf/min." and "288,000 acf/min." Particulate emission rates are not consistent with Colony's latest estimates (8.2 and 32.9 lb./hr., respectively). (An appropriate revision in the emission rate set forth in the fourth line from the bottom of page II-21 should also be considered.) Entries adjacent to "Exit Temperature" should both read "Ambient."

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26. Page II-29, Table II-5: Figure adjacent to "Total Stack Gases" should read "36,000 acf/min." Entry adjacent to "Exit Temperature" should read "Ambient." Particulate emission rate is not consistent with Colony's latest estimate (4.2 lb./hr.).
27. Page II-23, fourth line: The parenthetical phrase "(0.8 percent sulfur by weight)" should be revised to read "(less than .001 wt. % sulfur)."
28. Page II-24, Figure II-14: Location of stacks 25 through 30 should be revised as indicated in Attachment 1. (Battelle Northwest study was based on corrected locations.)
29. Page II-25, fourth paragraph: The following sentence should be incorporated into this paragraph:  
SO<sub>2</sub> in the ball heater flue gas is reduced substantially by contact with shale particles in the pre-heat system.
30. Page II-27, Figure II-16: Emission rates should be consistent with normal emission rates set forth in Table II-6.
31. Page II-28, Table II-6: Rates adjacent to "Firing Duty" should read "1830.6" and "94.3" mm Btu/hr. Order of emission rates adjacent to "Carbon Monoxide" should be reversed.
32. Page II-29, Table II-7: The component "Phenolics" should be revised to read "Phenolics."
33. Page II-30, last line: The word "raw" should be inserted before the word "naphtha."
34. Page II-33, Table II-8: Table II-8 should be corrected as indicated on Attachment 2.
35. Page II-33, second line: "1300 tons/day" should be revised to read "6300 tons/day."
36. Page II-35, Table II-9: Table II-9 should be corrected as indicated on Attachment 3.

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37. Page II-35, first sentence: The first sentence should be replaced with the following sentences:  
Arsenic is removed at the rate of 531 lbs./day from the feed to the reactors utilizing a proprietary catalyst. Solid wastes containing the arsenic in a chemical form only slightly soluble in water will be transported to the spent shale disposal area and mixed with the processed shale as discussed in greater detail on page II-53.
38. Page II-36, last line second paragraph: Parenthetical phrase "(0.8 percent)" should be revised to read "(less than .001 wt. %)."
39. Page II-36, first line: Insert "NH<sub>3</sub> stripper" after the words "separation unit."
40. Page II-36, eighth line: Substitute "reactor effluent" for the words "gas oil."
41. Page II-37, sixth line: Revise line to read: This furnace will burn, at the rate of 8.4 mm Btu/hr., treated gas or fuel oil.
42. Page II-38, Table II-10: Table II-10 should be corrected as indicated on Attachment 4.
43. Page II-40, second paragraph, last sentence: NH<sub>3</sub> and CO<sub>2</sub> are not sulfur compounds. The last sentence should be revised to read as follows:  
The unit converts H<sub>2</sub>S, SO<sub>2</sub>, and organic sulfur compounds into a marketable liquid sulfur by-product.
44. Page II-41, third line from bottom: The words "about 250 ppmv" should be revised to read "less than 250 ppmv." 250 ppmv is an upper limit guaranteed by the licensor. Some operating units have achieved much lower emission rates.

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45. Page II-42, Table II-11: Table II-11 should be revised to read as follows:
- |                   |   |                 |
|-------------------|---|-----------------|
| Total Stack Gases | - | 90,000 acf/min. |
| Exit Temperature  | - | 3000 F.         |
| Moisture Content  | - | Sat'd @125° F.  |
46. Page II-48, Table II-13: Table II-13 should be revised as indicated in Attachment 5 to be consistent with the revised EIA.
47. Page II-49, Table II-14: The weight percentage adjacent to "HDN catalyst" under "Naphtha Hydrotreater" should be revised to read "68-78."
48. Page II-49, Table II-15: The word "each" should be deleted from the entry adjacent to "Number of Stacks." The rate adjacent to "Total Stack Gases" should read "57,000 acf/minute." The fourth line from the bottom should be revised to read "Normal Firing Duty - 144 mm Btu/hr." Order of carbon monoxide emission rates should be reversed.
49. Page II-51, fifteenth line: First word should be revised from "steam" to "stream."
50. Page II-52, second paragraph: Paragraph should be revised to read as follows:  
During normal plant operation emission rates will vary with operating levels of individual units and pieces of equipment. Normal emission rates shown in Tables II-6, II-8, II-9, II-11, II-12 and II-15 represent estimated means for all anticipated operating modes. Peak emission rates given in these tables are maximum rates which may be encountered when all processing units are operating at full capacity.
51. Page II-52, second line from bottom: Last two lines of page II-52 and first eight lines of page II-53 should be deleted on the bases that the information presented is either outdated, inaccurate, or irrelevant.

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52. Page II-54, Table II-16: Table II-16 should be revised as indicated in Attachment 6. Table should reflect the reduction by 95% (or more) of SO<sub>2</sub> in the preheat system and the reduction of fuel gas sulfur content to 10 grains per 100 standard cubic feet (by amine scrubbing) in the gas recovery and treating unit. Revised annual emissions from the shale oil plant (mgm/yr) shown in Tables II-16, II-17, II-18, II-19, and II-20 reflect the fact that not all units in the plant will operate at full capacity year round. Anticipated operation of pyrolysis and upgrading units include shutdowns or operation at reduced throughput as required for preventive maintenance or repair of random equipment failures.
53. Page II-55, Table II-17: Table II-17 should be revised as indicated in Attachment 7.
54. Page II-56, Table II-18: Table II-18 should be revised as indicated in Attachment 8.
55. Page II-57, Table II-19: Table II-19 should be revised as indicated in Attachment 9.
56. Page II-58, Table II-20: Table II-20 should be revised as indicated in Attachment 10.
57. Page II-59, Table II-21: Table II-21 should be revised as indicated in Attachment 11.
58. Page II-62, eighth line: The number "14" should be changed to "13."
59. Page II-62, fourth paragraph: Present paragraph is based on the assumption that Colony intends to cover processed shale embankment with 6-inch layer of natural soil. Depending upon success of direct revegetation on fertilized processed shale, soil cover may be unnecessary.
60. Page II-63, sixth line from bottom: Sixth line from bottom should be revised to read "ranges from 12 percent to 14 percent."

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Bureau of Land Management  
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61. Page II-63, fourth line from bottom: The words "To the maximum extent possible," should be added to the beginning of the sentence beginning "The elevation of ..."
62. Page II-65, second paragraph: The following phrase should be added to the beginning of the first sentence of the second paragraph:  
"If efforts to vegetate processed shale without adding natural soil prove unsuccessful,"
63. Page II-67: Discussion under "Water Supply" should be revised to include full discussion of contract for water from Ruedi Reservoir.
64. Page II-67, second line, second paragraph: The words "up to" should be inserted prior to the number "7,200."
65. Page II-67, sixth line, second paragraph: The number "52,000" should be revised to "152,000."
66. Page II-69, third full paragraph: Colony does not plan to capture and recycle all water draining from the Dow West property as stated on page II-69. Runoff in Middle Fork in excess of the dead storage capacity of Middle Fork Dam will be passed through the reservoir. In addition, Colony plans to release water below the Davis Gulch catchment dam to insure the protection of senior downstream water rights.
67. Page II-73, Figure II-32: Capacity of intake station and pump house is actually 6500 gpm. Normal operating level will be 5610 gpm.
68. Page II-74, fifth line: Sentence beginning "All water" should be revised to read as follows:  
All water used at the plant site will be consumed, evaporated or incorporated into the processed shale embankment.

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Bureau of Land Management  
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February 12, 1976

69. Page II-75, third paragraph: Sale of the dams is not a "substantial" possibility - it is merely one of the alternative methods of disposition. In addition, if the dams are not sold, they could be put to other uses. Removal is not the only alternative under these circumstances.
70. Page II-76, first paragraph: The following two sentences should be added to the end of this paragraph:  
A thorough analysis of the alternate corridors available for powerline use is set forth on pages IX-32 through IX-55 hereof. This analysis is based in part upon studies prepared for Public Service Company.
71. Page II-83, second full paragraph: The first sentence of the paragraph should be replaced with the following sentences:  
Colony intends to contract with The Denver and Rio Grande Western Railroad for the construction of a 10,000-foot siding within the existing right-of-way and a spur line to the Grand Valley facilities. Approximately one-third of the total trackage is covered by an existing construction contract.
72. Page II-85, Table II-24: The emission rates for NO<sub>x</sub> and carbon monoxide should be corrected to read as follows:  
NO<sub>x</sub> Content - 0.4 Kg/hr.  
Carbon Monoxide - 0.05 Kg/hr.
73. Page II-89, first line: "Atlantic Richfield Corporation" should be revised to read "Atlantic Richfield Company."
74. Page II-91, Table II-28: Wall thickness from Lisbon Terminal to Moab should be corrected to read "0.375."
75. Page II-92, third full paragraph: The following sentence should be added to the present paragraph:

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Bureau of Land Management  
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The ultimate distribution pattern will be a function of the type and degree of control exerted by Colony and state and local governmental authorities over community development.

76. Page II-92: Although induced population is discussed in terms of five hypothetical patterns in this section, the same topic is analyzed in terms of the three cases described on page IV-188 in Chapter IV. A more thorough explanation for the use of the distinct methods of analysis should be included.
77. Page II-104, fourth line: The statement that Occidental's in situ process "requires practically no water" should be verified for accuracy.
78. Page II-107, seventh line: Insert the following new sentence after the sentence ending "- 16 miles:"  
None of the participants in these projects have announced any intention to transport commercial quantities of shale oil by means of the La Sal pipeline or to construct connecting pipelines.
79. Page II-109, last paragraph: Substitute the words "the federal leasing program" for the words "oil shale development."
80. A reference to Colony's spent shale disposal and revegetation studies should be added at appropriate points in the text of Chapter II and added to the list of references on page II-111.
81. Page III-1, second paragraph, second line: Substitute the words "the federal oil shale leasing program" for the word "others."
82. Page III-11, third paragraph, last sentence: This conclusion, which is based upon a similar conclusion set forth in the Dames & Moore report

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Bureau of Land Management  
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dated April, 1973, fails to take into account supplementary meteorological and climatological work performed by Dames & Moore after the completion of the 1973 report. In view of the combined data produced by these studies, the last sentence should be revised to eliminate the erroneous impression that the meteorological data is inadequate.

83. Page III-11, Table III-1: Except for particulates, the concentrations listed in Table III-1 are universal theoretical estimates extracted from the Dames & Moore study. They are not based on measurements taken at the semi-works plant site. If the intention is to make use of the theoretical estimates, the following clarifying changes should be made. The first sentence of the last paragraph of page III-11 should be deleted. The word "were" in the third line of the last paragraph should be changed to read "have been." The words "in Parachute Creek" should be deleted from the fourth line of the last paragraph. In view of the fact that the particulate concentration is not a theoretical estimate, and that Dames & Moore concluded that background levels of particulates have median values less than 15 ug/m<sup>3</sup>, "Particulates" should be deleted from Table III-1.
84. Page III-32, third full paragraph: The following new last sentence should be added: Colony has applied for 1000 acre feet per year of water from this source for use in the community facilities currently planned for Battlement Mesa.
85. Page III-33, first two paragraphs: This section should be broadened to include a discussion of Colony's private water rights. See "primary Water Supply Strategy for One Oil Shale plant in Parachute Creek Basin," Wright Engineers, April, 1973 - Colony EIA Appendix, Volume 12. It should be emphasized that Colony's private rights are of relatively high priority and that except during periods of extremely low flow in the Colorado River, Colony's rights will be adequate to satisfy the full requirements of the plant complex.

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86. Page III-52, last line: Add the following language after "historical significance."  
...although, as indicated on page IV-172, the proposed plant and pipeline should not disturb any recognizable or unchanged portion of the abandoned grade.
87. Page III-60, top: The title at the top of this page should be revised to read "Land Use Plans, Policies and Controls."
88. Page III-60: The discussion on land use, plans, policies and controls should be broadened to include a discussion of consequences and implications of the designation of the Piceance Basin by the EPA as an Area-wide Waste Treatment Management Planning Area under the Federal Water Pollution Control Act Amendments of 1972 and as an Air Quality Maintenance Area under the Clean Air Act.
89. Page III-62, third paragraph, last sentence: The Oil Shale Regional Planning Commission was in effect disbanded when the Colorado West Area Council of Governments was created.
90. Page III-63, eighth line: The Land Use Commission has not been considered a "temporary" commission by most observers for the last 2-3 years.
91. Page III-87: No discussion of employment multipliers is found in the section entitled "Employment." In view of the impact of indirect or secondary employment resulting from the project, a discussion of the current multiplier effect from different segments of the economy is suggested.
92. Pages III-90, III-91: A comparison of data on remaining bonding capacity in this section with data in the report entitled "Impact - An Assessment of the Impact of Oil Shale Development - Colorado planning and Management Region 11," December, 1974, indicates that the unused bonding capacity for some school districts may be less than is listed in the impact statement. For example, Table III-25 states that the Grand Valley School District

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- has a remaining bonding capacity of \$408,160 while the study referred to above indicates only \$273,779 is available.
93. Page III-93, Table III-27: In view of the inclusion of data on schools, the title to Table III-27 should be revised to include a reference to school facilities.
94. Page III-134, eighth line from bottom: The word "extreme" should be changed to "stream."
95. Page III-137: The first two sentences on this page are inconsistent and should be verified.
96. Page III-137, Table III-32: Table III-32 is not complete and should show values for May (131.0 cfs) and November (5.79 cfs). The rate for December should read 3.68 cfs. The correct reference for this Table is:  
Colony EIA Appendix Volume 7.  
J. R. Meiman, "Hydrologic Inventory Analysis and Impact Study of the Colony Property, Garfield County, Colorado," 1973.
97. Page III-137: Reference (49) after "Runoff Intensity" is incorrect as is reference (17) on Table III-32.
98. Page III-153, second paragraph: Colony has attempted to locate and count these horses for several years with no success. A reference to the basis for the conclusion stated in the second sentence of this paragraph would be appreciated.
99. Page III-160, third paragraph: This paragraph should be clarified to state that the pipeline right-of-way will be routed around existing or potential slide areas.
100. Page III-164, fourteenth line: Change "elmex" to read "emex."
101. Pages III-169, sixth line; III-170, fourth line; III-171, second line: Change "saltbrush" to read "saltbush."

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102. The features described in the following text references in Chapter III are not included in the specified figures:
- |           |            |
|-----------|------------|
| Ref. Page | Figure No. |
| III-3     | III-5      |
| III-143   | III-59     |
| III-180   | III-89     |
103. Page III-188: In footnote (42) the name "Dafield" should be revised to read "Duffield."
104. Page IV-2, Table IV-1: The attempt to quantify qualitative judgments in this form can be extremely misleading. Readers should be cautioned that the judgments presented are summary in character and that the actual text should be examined to determine the BLM's actual conclusions as to the degree of specific impacts.
105. Page IV-6, second paragraph, first line: Insert the word "earlier" after the word "the."
106. Page IV-6, third paragraph, third line: After the word "plateau," substitute the words "located approximately        km from the plant site which was ultimately chosen."
107. Page IV-6, third line from bottom: Insert the word "former" before the word "plateau."
108. Page IV-7, fifth paragraph: The Battelle Northwest study did not include emissions from the utility boilers at Grand Valley, portal transfer point, transfer tower and reclaim tunnel due to the fact that they are in locations remote from the plant site or at substantially different elevations. A statement to this effect should be added to this paragraph.
109. Page IV-7, fourth line from bottom: Substitute the word "Maximum" for the word "peak."
110. Page IV-8, Figure IV-1: Change title of Figure IV-1 to read "Distribution Grid of Hypothetical Sampling Points."
111. Page IV-9, Table IV-2: Table IV-2 should be revised as indicated on Attachment 12.

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112. Page IV-10, fourth full paragraph, second sentence: The meaning of this sentence is unclear.
113. Page IV-10: The evaluation of computer predictions of 3 and 24 hour maximum short term concentrations fails to account for the fact that meteorological data were not available for a full 365 day year. While it is true that data were obtained for 12 calendar months, and resulting projections should be reasonably reliable, occasional meteorological data losses inevitably occurred. In predicting the number of days or hours per year that a given concentration might be exceeded, it is therefore necessary to "normalize" the computer projections. This subject should be further examined with personnel familiar with the Battelle Northwest study.
114. Page IV-27, second paragraph, second line: Substitute the words "air contaminants" for the word "emissions." This paragraph should also be revised to indicate need to normalize projections.
115. Page IV-27, last sentence: Conclusion fails to account for the fact that Colony should be able to avoid actual violations by curtailing operations or by burning hydrotreated shale oil as a plant fuel whenever local ambient concentrations of SO<sub>2</sub> produced by the plant approach applicable state limitations. In addition, the sulfur tail gas unit emission rate used in the Battelle Northwest study was based on an assumed concentration of 250 ppmv. Emission concentrations resulting from actual operation could be substantially lower.
116. Page IV-28, seventh line: Substitute "theoretical ambient background" for the words "existing ambient."
117. Page IV-28, eighth line: The following sentences should be inserted after the sentence ending "Creek area."  
Measured background levels are low enough to tax the ability of available instrumentation. Data obtained to date indicate no serious discrepancy.

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- ancies when estimating average base-line concentrations, although some relatively high short term levels of particulates have been observed.
118. Page IV-28, fourth paragraph, first line: Change "plants" to "plant."
119. Pages IV-28, eleventh line from bottom; IV-21, ninth line; IV-33 seventh line and sixth line from bottom; IV-34, eighth line: The high ambient concentrations of pollutants predicted at grid point 135 should be used with extreme caution due to the lack of consistency with the surrounding grid points. The high anomalous predictions at this point could be due to incorrect data input or computer error. No logical reason can be found to explain why such high values could occur at such a distance from the plant site.
120. Page IV-28, fourth paragraph: Discussion fails to distinguish between total hydrocarbons and non-methane hydrocarbons.
121. Page IV-30, Table IV-5: Table IV-5 should be revised in accordance with recent changes to state standards.
122. Page IV-31, line 5: An annual mean of 3.5 ug/m<sup>3</sup> would violate the revised state standards for Category 1 areas. Colony anticipates, however, that the Piceance Basin will be reclassified as a Category 2 area in anticipation of oil shale development. In addition, computer models are not precise and are generally conservative on the side of over-predicting ambient concentrations. Furthermore, projected ambient SO<sub>2</sub> concentrations should be judged in the light of the observations set forth in Comment 115 above. It is also unclear whether the revised state standards are intended to apply within the property boundary. Grid point 32 is within the Dow property boundary.
123. Page IV-31, third paragraph, lines 2 through 4: With respect to the conclusion regarding state standards, note observations set forth in Comment 115 above.

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124. Page IV-33, third full paragraph: The following, new last sentence should be added to this paragraph:  
Particulate emissions from the primary crusher were not included in the Battelle Northwest study.
125. Page IV-33, next to last line: The parenthetical phrase "(out of the 213 days for which calculations were possible)" should be inserted after the words "1 to 33 days."
126. Page IV-35, eighteenth line: The words "relatively high" would be more appropriate than the words "quite high."
127. Page IV-35, last line: Insert the words "and primary crushing" after the word "mine."
128. Page IV-35, Table IV-6: The words "And Primary Crushing" should be inserted in the title to Table IV-6 after the word "Mining."
129. Page IV-37, last line: Add the following sentences to the last paragraph:  
Such studies are generally used only for preliminary evaluations. Since no ambient air quality problems were indicated by these analyses, Colony did not consider it necessary to attempt more sophisticated modeling.
130. Page IV-41, last two lines: Comparisons of the values presented in Table III-1 and Table IV-9 are not valid. The values in Table III-1 represent theoretical long term average concentrations while the calculations in Table IV-9 are short term maxima. It should be noted, for example, that short term variations in naturally occurring concentrations could be expected to exceed the values set forth in Table III-1.
131. Pages IV-41 and IV-42, Table IV-9: The assumption that the worst ambient concentrations predicted by different diffusion models can be added together is not valid. The Battelle computer model was used to predict concentra-

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trations at specific grid points around the plateau plant site. The grid points used for the values presented in Table IV-9 are not stated, but it is likely that they are located on the plateau northeast of the plant site. The box model was used to predict concentrations in Parachute Creek Canyon. Traffic related concentrations in the Canyon could be highest when there is a low level inversion (say 300') with low wind speed. Under these conditions it is likely that plant and mine related emissions would not become entrained in valley drainage flow. In other words, the meteorological conditions which would produce a worst case situation in the valley would not produce a worst case situation on the plateau and vice versa. For this reason, it is questionable whether Table IV-9 and the related discussion are meaningful enough to be included in the final statement.

132. Page IV-43, eleventh line: The statement regarding combined values on Table IV-9 in excess of applicable state standards should be reconsidered in light of the observations set forth in Comment 130 above.

133. Page IV-47, third line: The word "degraded" should be revised to read "degraded" throughout the statement.

134. Page IV-51, first full paragraph: Conclusion regarding state standards may be inaccurate if the revised state standards apply on the property. Predicted concentrations of SO<sub>2</sub> should be considered in the light of Comment 115 above.

135. Page IV-54, last line: The acre foot capacity of Middle Fork dam should be revised to read "300 acre-feet."

136. Page IV-55, first full paragraph: The purpose and potential use of the turnout valve below the Davis Gulch dam should be mentioned in this paragraph.

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137. Page IV-55, second full paragraph: Note Comment 136 above.

138. Page IV-56, eighth line from bottom: The last part of this paragraph should be clarified with the observation that due to storage and diversion projects completed since 1933, it is highly unlikely that the record low will ever be equalled again.

139. Page IV-56, thirteenth line from bottom: The words "river flow" should be substituted for the words "surface runoff."

140. Page IV-58, third line: Delete the words "for consumption" from the end of this line.

141. Page IV-58: The title "Green Mountain Reservoir should be revised to read "Green Mountain and Ruedi Reservoirs" and the discussion should be expanded to cover Ruedi water contract. In addition, some reference to the benefits of releases from the Green Mountain Reservoir during low flow periods should be added to this section.

142. Page IV-60, third and fourth lines: Reference is made throughout the statement to the fact that mining activity and dewatering will seriously affect local spring and stream flows. Colony does not believe that this result will necessarily occur. The major springs at the head of Davis Gulch and Middle Fork appear to be perched on the top of the Parachute Creek Member, indicating that the Member functions as an effective aquitard at that location. Colony's mining activity will only remove a portion of the Mahogany Zone and it is expected to continue to function as an aquitard. In addition, there are other aquitards above the Mahogany Zone. To the extent that Colony's wells or dewatering activities do reduce surface flow, releases of water from the river water pipeline will be made to protect owners of senior water rights.

143. Page IV-61, last two lines: The Metcalf and Eddy study entitled "Water Pollution Potential

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from Surface Disposal of Processed Shale from the TOSCO II Process," October, 1975, concludes (contrary to prior expectations) that maximum penetration of water could be up to 5.5 feet in a year with double the average annual snowfall.

144. Page IV-63, Table IV-13: Title of fourth column should read "Concentration (Wt. ppm)"
145. Page IV-65, top of page: This discussion should be revised as appropriate to reflect results of Metcalf and Eddy leaching study.
146. Page IV-65, sentence beginning on fifteenth line: Conclusions regarding sulfates should be verified with Metcalf and Eddy and revised if necessary.
147. Page IV-65, paragraph entitled "Metallic Elements": Trace concentrations of metallic elements in oil shale are shown in Table IV-13, page IV-63 of the draft statement. Leaching studies conducted on processed shale have been carried out and the results published by Metcalf and Eddy. Their studies indicate that total dissolved solids concentrations in the runoff will be higher but chemically similar to that observed in Parachute Creek.
148. Page IV-67, sentence beginning on seventh line: Leaching studies on processed shale and spent catalyst mixtures were not completed for two reasons: (1) As indicated on page IV-68 of the draft statement, the relative quantities of catalyst material to be disposed of in the shale embankment will be almost insignificant and difficult to measure quantitatively and (2) it may not be necessary to dispose of catalysts in this manner depending on the availability of catalyst reprocessing services when the plant begins operation.
149. Page IV-68, first full sentence: Conclusion regarding phenols should be verified with Metcalf and Eddy.

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150. Page IV-68, last paragraph: The Metcalf and Eddy study did not include analyses for arsenic. This paragraph should be revised accordingly.
151. Page IV-69, third sentence: This statement should be verified with Metcalf and Eddy.
152. Page IV-69, last paragraph, second sentence: As indicated in Attachment 13, it is not possible at the present time to predict with certainty what the future of the plant complex will be after conclusion of the Dow West project. The procedures summarized in Attachment 13 illustrate that Colony has considered some of the alternatives in detail. The fact that no ultimate decision has been made regarding the disposition of the plant complex does not necessarily indicate poor planning as this sentence implies.
153. Page IV-88, last paragraph: Discussion should be broadened to include reference to Ruedi Reservoir.
154. Page IV-89: Discussion regarding spill potential should be revised consistent with statement of L. C. Foy.
155. Page IV-91, fourth paragraph: The first sentence is misleading. The .12 mg/l increase is nothing more than a hypothetical estimate based on an extremely simplistic set of assumptions. Depending upon the circumstances of Colony's actual water use, the net effect of the plant on downstream salinity could be beneficial.
156. Page IV-91, sentence beginning on fifth line from bottom: Actual reduction of water flow in Parachute Creek should be less due to use of turnout valve to protect senior water right owners.
157. Page IV-93, fourth and fifth lines: Note Comment 142 above.
158. Page IV-93, first full paragraph: Less emphasis should be devoted to the impact of highly improbable events such as the failure of the Davis Gulch catchment dam and more emphasis should be placed on the impacts which are expected to occur as a result of normal plant operation. In

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addition, the discussion fails to consider the dilution which should take place within the dam in the event of such a flood. The last sentence overstates the potential effects on Parachute Creek and the Colorado River.

159. Page IV-98, first paragraph: As indicated previously, Colony may not need to place a natural soil cover on the processed shale embankment as a part of revegetation program. This paragraph should be revised accordingly.
160. Page IV-99, second paragraph, last sentence: This sentence states that 87.5 acres of selected lands will probably be covered with processed shale. In fact, 7.5 acres of land in Section 1, T 5 S, R 96 W may be covered with processed shale, while the 80 acres in Sections 11 and 14 of T 5 S, R 96 W are on the border of the plant site and may only be partially affected.
161. Page IV-106, second full paragraph, first sentence: This conclusion is misleading. Non-commercial quantities of dawsonite, halite and nahcolite will be removed from the mine, subjected to the retorting process and dumped in the processed shale embankment. These minerals will not be "lost."
162. Page IV-107, second paragraph, first line: "Tracks" should be revised to read "tracts."
163. Page IV-109, first paragraph: It should be noted that bauxite of commercial interest contains 40-50% alumina and that the 1% alumina found in raw shale beneath the Dow West property is far below the commercial grade of alumina ore presently of interest to aluminum producers.
164. Page IV-114, sentence beginning on fifth line from bottom: Conclusion stated is not correct and should be revised consistent with statement of L. C. Foy.
165. Page IV-115, sixth line from bottom: It is doubtful whether deleterious hydrocarbons would remain in the soil very long. The aromatic

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fractions should disappear rapidly from dry hot soil. In the absence of scientific reference material, the portion of this sentence referring to "long term sterilization of the soil by persistent oil residues" amounts to unsupported opinion.

166. Page IV-124, fourth paragraph, second line; Page IV-125, third paragraph, fifth line: "Exposers" should be changed to "exposures." Reference to tobacco seems irrelevant considering the absence of tobacco in the vicinity of the plant.
167. Page IV-126, tenth line: "Negrotic" should be changed to read "necrotic."
168. Page IV-129, tenth line: "346.2 ugm/m<sup>3</sup> should be changed to read "346.2 Kgm/hr.
169. Page IV-129, last five lines: Meaning of last sentence is unclear.
170. Page IV-131, eleventh line: Change "i.e." to read "e.g."
171. Page IV-131, eighth line from bottom: "Abscession" should be changed to read "abscission."
172. Page IV-133, second full paragraph, second sentence: This observation should be supported by specific reference to the threshold injury level involved, the type of vegetation likely to be harmed, and relevant scientific reference material.
173. Page IV-137, sentence beginning on seventh line: Note Comment 142 above.
174. Page IV-137, eighteenth line: Substitute the words "local disappearance" for the word "loss."
175. Page IV-139, fifth paragraph: What is the basis for these percentages?
176. Page IV-145, ninth line from bottom: "Absorbed" should be revised to read "adsorbed."

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177. Page IV-159, third full paragraph, second line: "Dore-response" should be revised to read "dose-response."
178. Page IV-163, sentence beginning on tenth line: Trout are not stocked on the Dow property.
179. Page IV-167, fourteenth line: "Perpetration" should be revised to read "perpetuation."
180. Page IV-173: The data set forth in the center of the page relative to noise levels are somewhat irrelevant in that they relate to specific pieces of equipment designed for that facility. At the time that equipment was designed noise regulations did not exist. Noise regulations have been considered in the design of the commercial plant and operations will be conducted in accordance with applicable regulations.
181. Page IV-179, first paragraph: The statement is made that Phase I covers 2 years, while Table IV-24 shows a 40 month construction schedule. As a result, a three year Phase I seems more realistic.
182. Pages IV 184-185: Tables IV-27, IV-28, IV-29 and IV-30 would be less confusing if the notations "By place of work" or "By place of residence" were applied.
183. Page IV-186, sentence beginning on sixth line from bottom: The description of the population model has been omitted from the Appendix.
184. Page IV-188: As indicated previously, further explanation should be provided for the switch from the five urbanization patterns mentioned in Chapter II to the three cases described on page IV-188.
185. Page IV-203, first two lines: The total plant cost currently exceeds \$850 million.
186. Page IV-209, last sentence: Without more specific information and in view of the observations set forth in Comment 115 above, the last sentence on this page amounts to no more than negative guesswork. Since it is not ex-

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- pected that primary national ambient air quality standards will be exceeded, especially in any urban areas, it appears unlikely that expected emissions from the proposed operations will result in any adverse health effects.
187. Page IV-211, sixth line from bottom; Page IV-214, fifth line: Note prior comments regarding grid point 135.
188. Page IV-212: Title should be revised to read "CARBON MONOXIDE."
189. Page IV-214, third line from bottom: "Track" should be revised to read "tract."
190. Page IV-223, first full sentence: There is no evidence that emissions from the plant complex will have any effect on human health.
191. Page V-3, fourth full paragraph: As indicated previously, portions of Table IV-5 are out of date.
192. Page V-4, first and second lines: The words "emission permit" should be substituted for the words "authority to construct and permit to operate."
193. Page V-5, fifth paragraph, first line: The words "up to 7200 acre feet" should be substituted for the rate "12.5 cfs." Ruedi Reservoir water contract should be included.
194. Page V-7, twelfth line: If discharged water contains no pollutants, EPA permits may not be required. If permits will be required they should be added to the list of federal actions described in the introductory chapters.
195. Page V-9, last paragraph: Depending upon local climatological and soil conditions, it may be beyond Colony's power to "revegetate" within one year. It would be more reasonable to require Colony or La Sal to plant within one year.
196. Page V-13, first two sentences: Colony's commitment to restore topography is only to

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simulate its original contours. Colony does not intend to restore its "original shape." In addition, there will be no need to reshape local topography in the event that the plant is sold or modified for use in processing Dow East reserves.

197. Page V-17: "Oryzopsis himenoides" should be corrected to read "Oryzopsis hymenoides." "Atriplex nuttallii" should be corrected to read "Atriplex nutalli."
198. Page V-18: "Oryzopsis himenoides" should be corrected to read "Oryzopsis hymenoides." "Sporobolus airoides" should be corrected to read "Sporobolus airoides."
199. Page V-19, fourth line from bottom: Insert the words "to the maximum extent possible" after the word "activities."
200. Page VI-1, sentence beginning in fourth line: Delete "3- and 8-hour." Note Comment 115 above.
201. Page VI-1, third paragraph: The turnout valve on the river water pipeline should be mentioned. The reduction average annual flow of Parachute Creek will not be as great as stated in this paragraph.

202. Page VI-1, last paragraph: This paragraph should be reworded as follows:  
The projected water consumption of 12.5 cfs from the Colorado River would reduce the average annual flow of the river at DeBeque (3,659 cfs) by 0.34 percent. Any reduction in the flow of Parachute Creek as a result of dam construction on Davis Gulch and Middle Fork which could interfere with senior water rights will be made up by releasing water from the pipeline near the head of Parachute Creek Valley. This release could be part of the 12.5 cfs of water diverted by Colony.

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203. Page VI-2, first paragraph: Note Comment 155 above.
204. Page VI-2, second paragraph: Include appropriate reference to Ruedi Reservoir.
205. Page VI-2, third paragraph: At several points in the statement it is stated that the Middle Fork dam will reduce beneficial silt flushing in Parachute Creek. It should be noted that except for its dead storage capacity of 300 acre feet, the Middle Fork dam will automatically allow up to 400 cfs to pass through an outlet. Although the structure will serve to reduce the destructive effects of extremely high runoff events, it should not interfere with the beneficial flushing effects of seasonal runoff which is normally far below the 400 cfs flow through capacity.
206. Page VI-2, fourth paragraph, first line: Change the figure "200" to read "300."
207. Page VI-3, fifth paragraph: Depending upon the degree of dilution at the time of overtopping (and the incidental havoc a storm of proportions sufficient to cause overtopping would wreak on Parachute Creek) or dam failure, it is possible that the degree of adverse impact may not be as acute as suggested by this paragraph.
208. Page VI-3, last sentence: This sentence should be completely revised. The paragraph should contain general conclusions regarding runoff from spent shale based on the Metcalf and Eddy leaching and runoff study, and the CSU (or "Ward") study referred to in earlier portions of the text.
209. Page VI-4, first paragraph: Note Comment 142 above.
210. Page VI-4, third paragraph: To put this impact in perspective, some mention should be made of the fact that sediment loads in Para-

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chute Creek and in the Colorado River occasionally reach very high levels during runoff events such as thunderstorms (which occur regularly) and spring runoff.

211. Page VI-4, sentences beginning on eighth and third lines from bottom: Note Comment 142 above.
212. Page VI-4, last sentence: This sentence necessarily repeats what has already been stated in the third paragraph of VI-4.
213. Page VI-5, first paragraph: This paragraph repeats what is stated in the fifth paragraph of page VI-3. Note Comment 207 above.
214. Page VI-5, fourth paragraph, first line: Note Comment 59 above.
215. Page VI-7, second full paragraph, second line: As indicated previously, to say that the alumina is "lost" is misleading.
216. Page VI-9, second full paragraph: Without reference to specific long-term ambient concentrations predicted by the Metcalf and Eddy study and the specific types of local species that will be affected in this manner, this paragraph constitutes nothing more than unsupported speculation.
217. Page VI-10, third paragraph: To cite illegal hunting of golden eagles (a federal offense) as an impact of the project is stretching a bit.
218. Page VI-10, fifth paragraph: The draft statement contains no basis for the "slight effect" mentioned in this paragraph.
219. Page VI-11, sentence beginning on fourth line from bottom: Note Comment 217 above.
220. Page VI-12, third full paragraph: Note Comment 205 above.

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221. Page VI-13, last paragraph: Here and in other sections of the statement reference is made to the impact of the project on "secretive" local populations of bear and mountain lion. The statement fails to point out that confirmed sightings of these species in the areas which will be affected by the construction of the plant complex and service corridor have been extremely limited in recent years. To the extent that the local disappearance of these species is due to general population increases and related development, further reductions in local numbers are likely to occur regardless of whether the plant is built. Considered in this context, the additional impact attributable to the Colony plant may be less significant than indicated.
222. Page VI-14, first paragraph, sixth line: Insert the word "temporary" after the word "unavoidable."
223. Page VI-18: The availability or lack of sufficient quantities of housing may pose substantially different problems during the construction phase as opposed to the operation phase. More discussion relative to housing of these two distinct phases is suggested.
224. Page VI-18, second paragraph: The construction of mobile home parks is subject to strict local building codes and zoning regulations which should eliminate this potential problem.
225. Page VI-19, first paragraph: Enforcement of applicable federal regulations will ensure that inadequately treated sewage effluent will not be discharged into the Colorado River.
226. Page VI-19, last paragraph: In this paragraph and at page IV-206, the draft statement suggests that severely negative socio-economic impacts will inevitably result from the construction and operation of the plant. A more balanced analysis would include references to the fact that this area of the state is not

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without serious socio-economic problems at the present time and that the Colony project is just as likely to produce substantial socioeconomic benefits for local communities. Although the negative bias may have been unintentional, the final statement should be more objective in its conclusions.

It is ironic that Chapter VI, which is supposed to address unavoidable adverse effects of the proposed action, devotes so much emphasis to the impacts of avoidable events such as failure of dams, pipeline spills, etc.

Page VII-2, third paragraph, third line: "Dilutant" should be changed to read "diluent."

Page VII-3, first full sentence: This sentence should be revised to read as follows:

A minute increase in downstream salinity may occur in time as a result of this project depending upon the actual circumstances of Colony's water use.

Page VII-3, first full paragraph: Paragraph should include a reference to future construction of federal desalinization facilities.

Page VII-3, second full paragraph: Note Comment 142 above.

Page VII-5, last paragraph: Note Comment 221 above.

Page VII-7, eleventh line from bottom: Depending upon the degree of planning by Colony and local jurisdictions, "overcrowding" may never occur.

Page VIII-1, seventh line: Change line to read "time, will be removed from underground reserves and deposited in the processed shale embankment."

Page VIII-1, Energy Output-Input Ratio: Note statement of D. C. Varisco.

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Page IX-1, last line: Insert "or from Ruedi Reservoir" after the word "Reservoir."

Page IX-3, sentence beginning on eighth line from bottom: This statement is out of date and should be deleted.

Page IX-4, first paragraph: The comparison referred to in the statement on the prototype leasing program is outdated. It is suggested that other source material be reviewed and that the final statement include an expanded discussion of this subject.

Page IX-4, MINING METHODS: Note relevant comments in statement of H. M. Dole.

Page IX-7, IMPACTS: The discussion of impacts resulting from the in situ and modified in situ methods is quite misleading. The significant impacts of this method appear to have been deliberately understated. See relevant portions of statement of H. M. Dole.

Page IX-13, indented table: The sulfur plant and tail gas unit will be required for emissions control regardless of the degree of upgrading done at the plant site. As a result, the first line of this table should be revised as follows:

SO<sub>2</sub> 14 percent or 18 Kgm/hr

Page IX-13, third paragraph: 2400 gpm is more than 21 percent of 5600 gpm (12.5 cfs), 2400 equals 43 percent.

Page IX-13, ninth line from bottom: Insert the word "local" after the word "annual."

Page IX-14, first full sentence: This statement is speculative and cannot be supported in fact.

Page IX-15, last sentence: It should be noted that substantial energy losses result from long distance transmission of electrical power.

Letter to: State Director  
Bureau of Land Management  
Page - 33

February 12, 1976

246. Page IX-17, first paragraph: It should be noted that the cost of transporting raw shale long distances prior to retorting (either by truck, train, or slurry pipeline) would ensure the economic infeasibility of the project.
247. Page IX-18, first full sentence: The following sentence should be substituted for this sentence:  
These requirements cannot be satisfied with existing technology.
248. Page IX-18, sixth line: "Patent No. 456,509" should be revised to read "Patent Application No. 456,509." The contents of this application will be confidential until a patent is issued.
249. Page IX-18, last sentence: Based on the status of the patent application, this statement amounts to mere speculation.
250. Page IX-19, third and fourth paragraphs: These conclusions cannot be supported in fact.
251. Page IX-20, first thirteen lines: These conclusions cannot be supported in fact.
252. Page IX-21, fourth paragraph: The last sentence is apparently based on the assumption that Colony's revegetation program will be unsuccessful.
253. Page IX-24, RUEDI RESERVOIR: The treatment of Ruedi Reservoir as an alternative source of water rather than a proposed source is misleading. The section should be revised to refer to Colony's application for water from this source and its intended use of such water.
254. Page IX-26, second full paragraph: Note Comment 142 above.
255. Page IX-26, third full paragraph: Appropriate reference to the purpose of the turnout valve on the river water pipeline should be added.

Letter to: State Director  
Bureau of Land Management  
Page - 34

February 12, 1976

256. Page IX-42, third paragraph: Alternative Corridor B-3 is not shown on Figure IX-5.
257. Page IX-57, PIPELINE ROUTES: This section should be reviewed consistent with relevant conclusions set forth in statement of L. C. Foy.
258. Page IX-67, PLANNED UNIT DEVELOPMENT: The PUD planned by Colony for Battlement Mesa constitutes an alternate solution to the local socio-economic impacts of the construction and operation of the plant. As such, the overall environmental impacts of this alternative should be discussed more thoroughly. The report entitled "Ecological Inventory of the Grand Valley Area," Geocology Associates, 1974, Colony EIA Appendix Volume 16 should be quite useful for this purpose.
259. Page IX-68, second paragraph, first line: The total "1,268" should be changed to "approximately 3,000."
260. Page IX-70, Table IX-10: Footnote (b) of Table IX-10 should read "Total land area is based on an estimated requirement of .28 acres/housing unit or 4 dwelling units/acre."
261. From time to time, the issue of the carcinogenic potential of materials used in and produced by the plant complex has been raised. Based upon its own analyses and extensive research work currently being conducted by outside consultants, Colony believes that the carcinogenic potential of these materials will be no greater than that normally associated with materials handled at any typical refinery. Although the BLM has been kept fully informed about this subject and the status of ongoing research work, this issue is not addressed in the draft statement. To avoid the argument that this topic has not been adequately con-

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Letter to: State Director  
Bureau of Land Management  
Page - 35

February 12, 1976

sidered by the BLM, an appropriate discussion of the carcinogenicity of materials handled at the plant complex should be included in the final statement.

Please do not hesitate to contact this office if you have any questions regarding the information presented in this letter.

Very truly yours,

*Hollis M. Dole* 4/7/76  
Hollis M. Dole

With Attachments:  
Attachments 1 through 13 and statements

(1 unbound copy of letter and all attachments)  
(2 bound copies of letter and all attachments)



## United States Department of the Interior

BUREAU OF MINES  
2401 E STREET, NW.  
WASHINGTON, D.C. 20241

#-15

September 7, 1978

## Memorandum

To: District Manager, Bureau of Land Management, Grand Junction,  
Colorado

Through Assistant Secretary--Energy and Minerals *Richard R. Reil*  
SEP 10 1976

From: Director, Bureau of Mines

Subject: Draft environmental statement, Proposed Development of Oil  
Shale Resources by the Colony Development Operation in  
Colorado, prepared by the Bureau of Land Management

This is in response to a recent telephone request from your office on the  
draft environmental statement for the proposed oil shale development by  
Colony Development Operation.

The voluminous statement is well prepared, exhaustive, and, in general  
objective. There is, however, some loss of objectivity in Chapter VIII  
covering irreversible commitments compared to that shown in other chapters.

On page IX-2, lines 8 and 9 under "Colony's No-Action Decision," we  
believe there is no justification for the statement that "... the impact  
of no oil produced by Colony would not be significant." Only the oil-  
field in Colorado--Rangely--has a daily producing rate higher than  
47,000 barrels. If this initial oil shale effort were successful, other similar  
mines and plants would be started. The proposed pipeline would have a  
daily capacity of 150,000 barrels by adding pumping units (p. II-90,  
last paragraph) sufficient to accommodate three plants. The real  
significance of Colony's proposal is much better stated in the section on  
"Delay Development" alternative.

Two minor corrections should be made. On page II-108, 4th paragraph,  
"Consolidated Coal Company" should be "Consolidation Coal Company."  
In the glossary, definitions should be given for Btu and Mgm; both  
are defined in the text but both are less well-known than most terms in  
the glossary.

Our criticisms notwithstanding, the document is well prepared, represents  
considerable effort, and the authors and editors are to be complimented.

*T. V. Folmer*  
Thomas V. Folmer  
Director



#-17

F. 17

# Comments concerning the E.I.S. for Colony Development Company

These comments are from Ed B. Baker, former consultant for revegetation to Colony from 1972-1974. I am no longer working for Colony and hope my comments will be regarded without bias because I was associated with Colony. My opinion is based on extensive studies of rehabilitation on processed shale and my personal experience. Opinions of oil shale development base their opinion of rehabilitation on personal views and tours of rehabilitation efforts, not on any actual studies they have done. Also, my comments reflect the opinion of a resident of Western Colorado, which is unusual based on persons who testified at the E.I.S. hearings.

Plant growth on processed shale would not be a questionable subject if the facts from extensive studies (1965-1976) were well known.

## Example 1

Dr. William A. Berg, a noted rehabilitation expert from C.S.U., studied the "Chemical Analysis of TOSCO II Processed Shale And Their Interpretations Relative To Plant Growth". The following are excerpts from that study: texture, determined a silt loam; pH, range 7.7 to 8.5 is generally within the range of some highly productive soils; Cation Exchange Capacity, a CEC of about 7me/100g for leached samples appears realistic, this relatively low CEC should pose no plant growth or mineral nutrition problems; soluble salts, unleached samples of processed shale are extremely saline, (2.4-26mmhos/cm) in this situation leaching would be desirable; Organic Matter, O.M. is 9-20%, but it is doubtful that the organic carbon in processed shale contains similar physical properties to organic matter in soils; Nitrate, unfertilized processed shale contains very little nitrogen as nitrate and

will probably require a long term program of periodic nitrogen fertilization; Phosphorus, unfertilized processed shale is low in available P, once added to the processed shale it would not be expected to leach out because P has limited solubility; Potassium, K could become limiting for plant growth and fertilization may be required; Calcium and Magnesium, Ca and Mg would be expected to be adequate; Sulfur, S is expected to be adequate; Boron, Because of high levels of B, boron toxicity is a possibility on certain species, however no symptoms have been noted in plants grown on field plots; Zinc, Iron, Manganese and Copper are within the values reported for Colorado soils; Sodium Absorption Ratio, the SAR decreases drastically with leaching. Soil test information for the processed shale detailed above was analysed by Agricultural Consultants Laboratory and a second series by Doctors Schemehl and McCaslin, from this information Dr. Berg made his analysis. To summarize, P and N were the only nutrients necessary for plant growth, K was a border line case. Salts, pH, high level of boron, and SAR are improved with leaching. Organic matter would be build up as vegetation is established.

## Example 2

Dr. Lawrence Schaal an early researcher in rehabilitation of processed shale concluded from his work: "The results obtained from the tests conducted at the Semi-Works plot indicate that excellent plant growth can be obtain in processed shale. Initial germination and good growth of certain grasses in processed shale which has been leached, mulched with peat moss and sawdust, and fertilized seems to present no serious problems. The most growth during the season was made by tall wheatgrass and Russian wildrye. The Englemann spruce, juniper, large and small leaf cottonwoods, Chinese elm, golden willow, sage and penstemon all showed some growth

during the season."

#### Example 3

From a review of earlier work and my own work I have drawn the following conclusions: The studies undertaken from 1965 to the present show it can easily be proven that processed shale is capable of supporting not only a plant cover, but a varied and productive plant cover with the initial preparation and subsequent management planned in Colony's revegetation program. Although early workers with processed shale were concerned about the dark color, high pH, high soluble salt content, and low fertility, present knowledge has shown that these concerns will not present unconquerable obstacles to a revegetation program.

The various studies undertaken in the revegetation program have shown that the detrimental effects of the dark color of processed shale can be compensated for by the use of a light colored mulch or soil cover.

The problem of the high pH and high soluble salt content can be handled through leaching, (the Metcalf and Eddy hydrologic study said the upper part of the disposal pile would desalinate itself after a period of years) and the nutrient deficiencies can be readily corrected through the addition of commercial fertilizers. Therefore, studies to date indicate optimism for success following a carefully studied program to establish vegetation on a commercial scale disposal embankment.

My main comment on the pipeline rehabilitation is that there should be more flexibility in the seeding mixture. More native species should be allowed, as long as their percentage in the expected stand not exceed the percentage in the surrounding vegetation. Salt grass should be limited to seeding with what seed that can be found at time of seeding. No one

that I know of sells saltgrass seed and very little is known about propagation, transplanting the rhizomes is one of the most successful methods. Saltgrass should be replaced in the seeding mixture with a grama grass, orgalleta grass, or sand dropseed, in some places Indian ricegrass may be preferable. Four species selected for each site may not be enough diversification. Also, aspen roots and native shrubs and trees should be allowed for transplanting in areas where they now occur.

In closing, I think a tremendous job was done by the B.L.M. team that wrote this E.L.S. Most opponents of Oil Shale and the E.L.S. are not experts on details of the subject and have little stake in Western Colorado. As a resident I am in favor of controlled Oil Shale development and tired of hearing from people from Eastern Colorado and the Eastern U.S. who make the most noise about saving Western Colorado but do not have to make a living here. Thank you.

*Ed B. Baker*

Ed B. Baker

RAYMOND R. RUMMONDS  
CHAIRMAN AND COLORADO  
RIVER COMMISSIONER  
COACHELLA VALLEY COUNTY  
WATER DISTRICT  
RAYMOND E. BADGER  
SAN DIEGO COUNTY  
WATER AUTHORITY

THE METROPOLITAN WATER DISTRICT  
OF SOUTHERN CALIFORNIA  
HAROLD F. PELLEGRIN  
EXECUTIVE SECRETARY



STATE OF CALIFORNIA  
**Colorado River Board of California**  
107 SOUTH BROADWAY, ROOM 8103  
LOS ANGELES, CALIFORNIA 90012  
(213 - 620-4480)

February 9, 1976

Mr. Dale R. Andrus, State Director  
Bureau of Land Management  
Colorado State Bank Building  
1600 Broadway, Room 700  
Denver, Colorado 80202

Dear Mr. Andrus:

We have reviewed the "Draft Environmental Impact Statement - Proposed Development of Oil Shale Resources" and wish to commend you on a complete and extensive evaluation.

We are pleased that Colony Development Corporation is committed to a zero discharge of waste water into Parachute Creek. This is consistent with the policy for industrial discharges adopted by the seven basin states in their water quality standards for salinity in the Colorado River. The plan of implementation for achieving the numeric salinity criteria calls for a no-salt return policy for industrial dischargers whenever practical for each state.

While we recognize that a decision as to the disposition of Davis Gulch Dam, at the end of the 20 year life of the project, has not been made, we would urge that the dam and the associated waste water control system be maintained following completion of the project to prevent any leachate or runoff from the spent shale pile from entering the Colorado River system in the future.

In considering alternative water sources, the use of poor quality waters from the control of saline point sources such as Glenwood-Dotsero Springs for a portion of the water requirement should be given consideration.

It would also be helpful if the assumptions used in determining the potential increased salinity in the Colorado River were given (page IV-88).

Sincerely yours,

*Myron B. Holburt*  
for Myron B. Holburt  
Chief Engineer

#-18

VIRGIL L. JONES  
PALO VERDE IRRIGATION DISTRICT

DEPARTMENT OF WATER AND  
POWER, CITY OF LOS ANGELES

IMPERIAL IRRIGATION DISTRICT  
MYRON B. HOLBURT  
CHIEF ENGINEER

"The original of this letter is handwritten;  
it was typed for clarity prior to reproduction here."

#-19

R. Grett  
Moab, Utah  
February 10, 1976

Gentlemen,

I would like to comment on the Draft Environmental Impact Statement on the proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado. The draft statement is basically a sound one, but I feel that at this time, the United States is not ready for oil shale oil. The processing at this time is very energy intensive and therefore makes it uneconomic to compete with even foreign oil prices. It would be a mistake for the government to guarantee oil shale development loans for a product so energy intensive and expensive and where no full scale production operation has been tried. Government monies would be more wisely spent in pursuing other forms of energy development (such as solar research) because the oil shale will remain there to be utilized if and when the economics and demand warrant its exploration.

In Chapter III, more research needs to be done in the Archeological and Paleontological section. Lawrence Royer has done a questionable study on the pipeline corridor and needs to be re-examined by an archeologist. Federal law prohibits the destruction of historical sites on public land; therefore, these sites need to be properly identified before pipeline construction begins.

In Chapter IX, the Moab Alternative should be utilized for that part of the pipeline in Utah. This choice follows closely the existing right-of-ways and will result in less disturbance of new land. The old 6 & 50 roadbed could be utilized, and by placing the pipeline nearly to I-70, chances are improved for an early detection of a leak or break. The existing roads are close to the pipeline, so construction, maintenance, and oil spill clean up crews can utilize the roads for easy and quick access.

In conclusion, I feel the development of oil shale on a commercial basis is ahead of its time for economic reasons and that if the plants are built in Western Colorado, then the Moab Alternative should be utilized in the construction of the pipeline.

Respectively yours,  
(sgd) Roger Grette  
Moab, Utah



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
WASHINGTON, D.C. 20240

In Reply Refer To:  
FWS/ES

ADDRESS ONLY THE DIRECTOR,  
FISH AND WILDLIFE SERVICE

#-20

FEB 4 1976

Memorandum

To: Director, Bureau of Land Management  
Acting Deputy Associate  
From: Director, U.S. Fish and Wildlife Service  
Subject: Colony Oil Shale Development, Colorado - Draft Environmental Statement

The Fish and Wildlife Service has reviewed the draft environmental statement prepared by your agency on the proposed development of oil shale resources in Colorado by the Colony Development Operation.

In general, the draft statement is well prepared and gives adequate treatment to most fish and wildlife resources and potential impacts of the project. Detailed comments are listed below:

## III-123

Description of existing wildlife resources would be more complete if some mention were made of invertebrates and microorganisms and of the inter-relationships among these organisms, soil, vegetation and larger forms of animal life.

## IV-58-Green Mountain Reservoir

It is stated that the reservoir would be drawn down annually about 8 feet below normal levels under worst conditions. We could not find any analysis of what impact this might have on the reservoir fishery.

Releases from Green Mountain Reservoir during low flow periods could be expected to have some effect, possibly beneficial, on aquatic habitat of Blue River below the dam. We found no discussion of this potential impact on fish habitat. Water quality is mentioned on IV 88 but nothing on physical factors such as surface area, pool-rifle ration, depth, etc.

20

## IV-140-2nd full Paragraph

Increased stocking induced by increased fishing pressure would result in greater costs to the Colorado Division of Wildlife and a more artificial type of fishery.

## IV-143-1st Paragraph

The area is apparently within historic range of the endangered black-footed ferret. Prairie dogs are essential to survival of this species. Therefore, almost any prairie dog colony is potentially important to restoration of the ferret population.

## IV-143-Gamebirds

"Alteration of strutting grounds could cause some loss in population numbers." In light of the specialized requirements for a successful combination of strutting and nesting habitat, alternation of strutting grounds would almost certainly cause some reduction in population.

## IV-144-Aquatic Birds

More emphasis probably should be given to the fact that 1500 acre Moab Marsh is almost the only sizeable block of wetland habitat within a large expanse of predominately arid terrain. The 15 acres to be lost is a small portion of the marsh. However, because of the limited amount of this specialized habitat in the general area, loss of even a small amount is potentially significant.

## IV-146-Last sentence

"There are no trout at or downstream of the river crossing." It should be added that the endangered Colorado squawfish does inhabit this portion of the river.

## IV-157-2nd Paragraph

We question the statement that "Eagles and most other raptorial birds are not usually affected by human activities in general." Repeated disturbance has been known to cause abandonment of nests. Also, even if a nest is not abandoned, exposure to predators and adverse weather is increased each time a parent bird is caused to leave the nest thus lowering the chances for successful reproduction.

Successful nesting by most raptors requires a suitable nest site near a productive hunting area. When an area containing this combination is rendered untenable through disturbance, a comparable replacement area is not always available.



IV-157-3rd Paragraph

An additional impact of disturbance would be increased physical stress on deer during critical winter periods when any added drain on an animal's energy can be crucial.

The opportunity to comment on the draft statement is appreciated.

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION

REGION EIGHT  
BUILDING 40 DENVER FEDERAL CENTER  
DENVER, COLORADO 80225



#-21

21

2

February 17, 1976

Of concern to highways also is the crossing by the pipeline of Interstate Route 70 near Cisco, Utah. At the permit stage and during construction we would expect adequate safeguards to assure no permanent disruption to the highway.

IN REPLY REFER TO:  
08-00.21

Your Reference:  
CO-912  
1792  
FC01

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

This office appreciates the opportunity to review the draft Environmental Impact Statement, Proposed Development of Oil Shale Resources, and Oil Spill Contingency and Response Plan for a Proposed Pipeline System by the Colony Development Operation in Colorado (and Utah). We offer the following comments:

Our major interest is the adverse impacts the heavy industrial traffic and the increased traffic resulting from increased population will have on the highway system. These impacts are identified in the statement; however, the economic consequences are not adequately addressed.

New construction and major reconstruction of the Parachute Creek service corridor and road service to a new town as well as extensive maintenance of the existing system are mentioned but the economic impacts of this work are not clear.

The statement should address the cost of bringing the existing highway system to a standard which will accommodate the increased traffic and the responsibility for such cost apportioned to the proper jurisdiction, i.e., State, county, municipality, or developer. If this information is not available, the cost of restoring the highway system to a standard which will accommodate the future traffic after the initial major development phase, and when the industry is under a stable operation situation should be provided along with the aforementioned apportionment of such costs.

The statement should also provide a better description of new roads and other highway related facilities necessary to accommodate the development and the responsibility for the costs.

*F. S. Allison*

F. S. Allison

A-6-39





#-22

United States Department of the Interior  
BUREAU OF OUTDOOR RECREATION

MID-CONTINENT REGION

MAILING ADDRESS: STREET LOCATION:  
Post Office Box 25387 603 Miller Court  
Denver, Colorado 80225 Lakewood, Colorado  
Telephone 234-2634

IN REPLY REFER TO:

FEB 18 1976

MEMORANDUM

TO: State Director, Bureau of Land Management, Denver  
Colorado

FROM: Assistant Regional Director, Land Use Coordination

SUBJECT: Review of draft environmental statement for the  
proposed development of oil shale resources by the  
Colony Development Operation in Colorado

We have reviewed the subject document and find that it adequately  
addresses the environmental concerns of this Bureau.

*Robert J. Arkins*  
Robert J. Arkins

A-6-40



Colony Development Operation  
1500 Security Life Building  
Denver, Colorado 80202  
Telephone 303 266 3741

Hollis M. Dole  
General Manager

#-23



February 17, 1976

State Director  
Bureau of Land Management  
Room 700  
Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Sir:

On Friday, February 13, we delivered to you our comments on the Draft Environmental Impact Statement for Colony Development Operation. Also delivered to your offices was a copy of Mr. H. E. Bond's letter of February 5, 1976, to Secretary of the Interior Thomas S. Kleppe. This letter was intended to be part of the general submission.

My purpose in writing you is to make certain that the Bond letter to Secretary Kleppe is definitely recorded as a part of our comments.

Very truly yours,

Hollis M. Dole

#-24



UNITED STATES DEPARTMENT OF COMMERCE  
The Assistant Secretary for Science and Technology  
Washington, D.C. 20230

February 17, 1976

Mr. Dale R. Andrus  
State Director, Colorado State Office  
Bureau of Land Management  
U. S. Department of the Interior  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

1976 FEB 23 AM 10 00 0

DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

Dear Mr. Andrus:

This is in reference to your draft environmental impact statement entitled "Proposed Development of Oil Shale Resources by The Colony Development Operation in Colorado". The enclosed comments from the National Oceanic and Atmospheric Administration, National Ocean Survey, are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving five (5) copies of the final statement.

Sincerely,

*Sidney R. Ballet*  
Sidney R. Ballet  
Deputy Assistant Secretary  
for Environmental Affairs

Enclosure Memo from: National Oceanic and Atmospheric  
Administration, National Ocean Survey



#-25

Natural Resources Defense Council, Inc.

917 15TH STREET, N.W.  
WASHINGTON, D.C. 20005

202 737-5000

New York Office  
15 WEST 44TH STREET  
NEW YORK, N.Y. 10036  
212 869-0150

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664 HAMILTON AVENUE  
PALO ALTO, CALIF. 94301  
415 347-1080

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David Sive  
Beatrice Abbott Duggan  
U.N. Representative  
John H. Adams  
Executive Director

February 11, 1976

Curtis J. Berklund  
Director  
Bureau of Land Management  
Department of the Interior  
Washington, D.C. 20240

Dear Mr. Berklund:

Enclosed are the comments of the  
Natural Resources Defense Council on the  
Department's draft environmental impact  
statement on Proposed Development of Oil  
Shale Resources by The Colony Development  
Operation in Colorado (DES75-62).

Sincerely yours,

Edward L. Strohbehn, Jr.

els:lcs

cc: Frederick N. Ferguson  
Bruce Blanchard

Enclosure

Natural Resources Defense Council, Inc.

25

917 15TH STREET, N.W.  
WASHINGTON, D.C. 20005

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15 WEST 44TH STREET  
NEW YORK, N.Y. 10036  
212 869-0150

COMMENTS OF

NATURAL RESOURCES DEFENSE COUNCIL, INC.

ON

U. S. DEPARTMENT OF THE INTERIOR,  
BUREAU OF LAND MANAGEMENT

DRAFT ENVIRONMENTAL IMPACT STATEMENT  
ON PROPOSED DEVELOPMENT

OF

OIL SHALE RESOURCES

BY

THE COLONY DEVELOPMENT OPERATION  
IN COLORADO

(DES 75-62)

December 12, 1975

Edward L. Strohbehn, Jr.  
February 11, 1976

## I. Introduction

The Natural Resources Defense Council, Inc. (NRDC) submits these comments on the Department of Interior's draft environmental impact statement on Proposed Development of Oil Shale Resources by Colony Development Operation (DES 75-62), published December 12, 1975.

At the outset we emphasize that the draft statement does not concern an active or realistic proposal: Colony has suspended operations on the Dow West oil shale tract and has not decided if it will reactivate development of the oil shale resources in issue.<sup>1</sup> If and when Colony decides to renew its oil shale operations on Dow West, the operations may differ significantly in scope and method from those on which the draft statement is based. Thus, the analysis in the draft statement is necessarily hypothetical.

It is a waste of the public's resources to prepare detailed, careful comments on the draft statement, particularly comments which discuss the technical, scientific,

---

<sup>1/</sup> See, e.g., statement of Hollis Dole, general manager of Colony's operations, as quoted in the December 1975 issue of Shale Country:

"Colony is still in a state of suspension . . . ."  
 ". . . ."  
 "As for 1976, everything depends on the government. If a federal synthetic-fuels policy is set forth, and if the Colony partners choose to reactivate the project, how fast we get going depends on the time of the year. It would take 6-9 months under the most optimal conditions."

economic, social, environmental, and related substantive issues involved in the draft statement. Similarly, we believe that it is a waste of the Department's scarce resources to complete preparation of a final statement on the hypothetical action. Thus, as NRDC informed Secretary Kleppe by letter of January 27, 1976 (a copy of which is attached) we believe that the Department should cease further work on the draft statement and should not undertake any further actions to prepare an environmental statement on the matters in issue unless and until Colony presents a similar or related proposal to the Department.

Accordingly, in these comments NRDC discusses briefly why the draft statement in issue is essentially meaningless and suggests a procedure which the Department might follow with respect to actions by Colony in the future to reactivate its operations on Dow West. In addition, the comments note a few issues which, on cursory review, seem to have been inadequately discussed in the draft statement.

## II. The Draft Statement Is Essentially Meaningless

The discussion of alternatives to the proposed action and their environmental impacts has no meaning since there is no realistic "proposed action." When and if there is a "proposed action" involving the Dow West resources, the proposal might be substantially different from the one discussed in the draft statement and the alternatives to the

proposed action would also be substantially different. Moreover, even if upon reactivation the basic proposal remains the same, the reasonably available alternatives may have changed substantially. These are the alternatives that are relevant to decisionmakers, including the public, and which must be discussed in a draft statement on the proposal.

Similarly, the discussion of the environmental effects of a realistic proposal may vary substantially from the discussion presented in the draft statement. First, although the basic methods of mining, extracting, and retorting oil shale may not change, technologies for avoiding and mitigating adverse environmental effects from such activities may be developed. Second, although the basic purpose of Colony's operations may remain the same -- recover oil from the shale -- the methods for recovering the oil may change, such as, for example, development of a commercial in situ process. In both cases, the environmental effects of the operations will be different from those discussed in the draft statement.

The discussion and analysis presented in the other chapters of the draft statement may also require extensive revision depending upon the facts and circumstances that exist when and if Colony renews its project. As a result, the draft statement does not provide the decisionmakers and the public with a realistic and practical analysis and comparison of reasonable alternatives which is a basic purpose of the NEPA process.

In addition, by undertaking at this time to complete the NEPA process on the inactive Colony Dow West project, the Department denies itself and the public the opportunity to reduce substantially the environmental impacts of Colony's oil shale operations. Pursuant to the Prototype Oil Shale Leasing Program, the Department is attempting to encourage the commercialization of shale oil production while maintaining and protecting the integrity of the environment.

In theory, the Prototype Program should result in oil shale operations which employ the best technologies and management practices available. The Energy Research and Development Administration (ERDA) is supporting a number of research and development activities concerned with production of shale oil. One purpose of these R&D efforts is to develop better, more environmentally protective, oil shale production technologies. The results of this research and of the Prototype Program's activities should, to the maximum extent possible, be used in other oil shale operations. This goal is more likely to be realized if the NEPA process regarding Colony's Dow West project is undertaken only when there is a realistic, active proposal, since the Department can condition its approval of the necessary leases, licenses, and permits on the use of such technologies and practices.

In sum, initiating and completing the NEPA process with respect to a hypothetical proposal is inconsistent with the letter and spirit of NEPA. Such action also denies both the Department and the public a number of substantial benefits.

III. A Suggested Procedure

NRDC recommends that the NEPA process not be initiated with respect to hypothetical actions. And NRDC has already recommended to the Secretary that further work on the NEPA statement in issue should cease.<sup>2</sup>

When and if Colony reactivates its Dow West development operations and seeks the permits, licenses, and related federal actions which are the subject of the draft statement (or similar federal actions), then the Department should circulate a new draft statement which meets the requirements of the Department's and BLM's regulations and the CEQ's guidelines, which responds to the comments submitted on the first draft statement, and which takes into account any changed circumstances, including new aspects of the proposed action and new research and development results.

If, however, upon reactivation of the Dow West project by Colony the Department believes that recirculation of the present draft statement together with a supplement would be consistent with the requirements of NEPA, then the Department must as a bare minimum, include in the supplement a summary of the comments received on the first statement and the Department's responses to these comments, discuss in detail all circumstances of the project which have changed and the environmental effects associated with them and their reasonable alternatives, and discuss new research and development results. This supplement should be indexed and paginated in a manner which facilitates easy cross referencing with the original draft statement.

---

2/ See Letter Of January 27, 1976 to Secretary Kleppe, which is attach

IV. Some Specific Comments

Set out below are a few brief remarks about parts of the draft statement. For the reasons discussed above, these remarks are not comprehensive in scope and are not detailed.

1. (p. I-3) The mention of using "the latest information available" and of the "technical and environmental studies" which are proceeding underscore why it is inappropriate to proceed with completing the NEPA process on this inactive proposal.
2. (p. II-53 through II-66; see particularly II-53, II-62, II-66) Underground disposal is not being considered, and the specific method of shale disposal "has not been firmly established." Disposal of shale wastes is the cause of some of the most severe impacts of shale oil production. Certainly no project should be permitted to proceed until this issue is fully and completely resolved and the adverse effects minimized to the maximum possible extent. This is particularly important since it is proposed to use lands obtained from the federal government through land exchange for disposal of shale (see p. II-85, Table II-26).
3. (p. II-67, II-83, IV-56, IV-60 through IV-93) The fact that water supply and water discharge problems have not been fully resolved is another critical factor underscoring the inadequacy of the draft statement and the inappropriateness of completing the NEPA process at this time. Water resources are extremely scarce and adverse impacts on water supplies

affect far more than the oil shale areas. Unless and until all water supply problems are resolved oil shale development projects should not be granted federal licenses, permits, leases, etc. which enable the project to proceed.

4. (p. II-66) The revegetation problem is unresolved. Unless and until it is known that the wastes can be rehabilitated and revegetated, the project should not be permitted to proceed.

5. (p. III-60) Has this detailed BLM land planning system been implemented yet? What effects will it have on decisionmaking regarding the proposed federal actions discussed in the draft statement?

6. (Chapter V, passim) Are Colony's "commitments" enforceable? If not, all such commitments should be made enforceable before federal approvals are obtained.

7. (pp. VIII-1 through VIII-7) If this Energy Output-Input Ratio is to be used for analytic, decisionmaking, or other purposes, it must be substantially improved. Significant costs are excluded from the analysis. Inadequate information is provided to permit relevant comparisons.

8. (Chapter IX) The discussion of alternatives is not sufficiently precise and detailed to be of use in comparing alternatives.



# United States Department of the Interior

GEOLOGICAL SURVEY  
RESTON, VIRGINIA 22092

#-26

OFFICE OF THE DIRECTOR

FEB 11 1976

## Memorandum

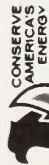
To: Director, Bureau of Land Management  
Through: Deputy Assistant Secretary--Energy and Minerals *Rolland-R. Reid*  
From: Director, Geological Survey  
Subject: Review of draft environmental statement for development of oil and shale resources by the Colony Development Operation, Colorado and Utah

FEB 13 1976

We have reviewed the subject draft environmental statement as requested by Mr. Manning.

Environmental impacts related to geologic conditions have been adequately considered in the draft environmental statement. The document is noteworthy for superlative illustrations and tabular data, particularly the maps and photographs; for the comprehensive discussion of risks of dam failure by overtopping, slope failure, foundation sliding or piping (p. IV-71 to IV-86); for the analysis of energy output-input ratios (p. VIII-1 to VIII-6); and for the oil-spill contingency plan, providing for prevention as well as emergency contingencies.

In regard to surface-water resources, although plans for reclamation at the end of the 20-year plant life are indefinite (p. II-5, par. 4), "mothballing" treatment of the facilities should also include rehabilitation measures, especially in the waste disposal area. Such measures would be needed to minimize any effects of erosion resulting from excessive storm runoff. Further, inasmuch as a specific method for disposing of spent catalyst and arsenic-removal waste-material has not been firmly established (p. II-53, par. 3), monitoring measures should be considered for the disposal site in order to minimize any adverse effects on the hydrologic environment resulting from either stormwater runoff or percolation. In order to minimize the effects of downstream flooding which may result from a surge flow from failure of both dams on Parachute Creek (p. IV-86, par. 3), measures permitting emergency releases of water from dams other than by overtopping should be considered.



Save Energy and You Serve America!

## Oil Shale Resources

2

Although the environmental statement, supported in part by the contingency plan, is in general very thorough in enumerating impacts on ground water, it does not attempt to evaluate even semi-quantitatively the magnitude, either in severity or duration, of several significant effects. The following seem to warrant additional consideration or clarification:

- (1) There are many references to effects of dewatering during mining, in both the principal plan and alternatives, and to the possible effects of pumping ground water as an alternate source of supply (e.g., p. IX-5, IX-6, IX-9, IX-26). Nowhere, however, do we find any concept as to the areal extent of the effects of dewatering. We believe that enough data are available, or can be obtained without unreasonable expenditure of time and money, to permit at least semi-quantitative estimation of this effect. Approximate life of the project, probable locations and depths of mining, order of magnitude of transmissivities and storage coefficients of aquifers involved, and existing ground-water level information (the factors which should provide a basis for such evaluation) should already be available from environmental assessment studies. It seems that for an operation of the scope of the proposed project a more adequate evaluation of the impact is warranted.
- (2) Dewatering will also produce some subsidence in addition to that produced by other mining operations. Although in the immediate area of mining the magnitude of such subsidence from dewatering may be less in magnitude, it will probably extend over a much larger area. The statement does not appear to recognize subsidence from this source, as it should, both because of the impact on the environment and because of the possible impact on the project, for example, on engineering works.
- (3) Duration and extent of post-project recovery in affected aquifers should be considered in terms of extremely long-term or permanent effects on quantity and quality of ground water.
- (4) Massive degradation of Parachute Creek and possibly the Colorado River are anticipated in the event of the failure of Davis Gulch catchment dam (p. V-3). Probable impacts on ground water should also be considered.
- (5) The processed shale will contain about 0.11 ppm of soluble arsenic (p. IV-68); this will result in the continuous addition to the processed shale pile of about 12 pounds of soluble arsenic per day. Presumably this amount will be distributed fairly uniformly throughout the shale pile. In addition, however, soluble arsenic will be added to the shale

pile after extraction from the feed streams. A proprietary process is to stabilize in relatively insoluble solid form 108 tons of arsenic extracted from feed streams per year. Disposal of the products of the proprietary process on the processed shale pile will add about 31 pounds per year of soluble arsenic to the pile, according to the text (p. IV-68). The manner in which this soluble arsenic is to be added to the pile is not explained. We note on page IV-68 that research on arsenic problems is in progress; however, we believe that the statement should be more explicit in treating mitigating measures. Specifically, the details of the program for disposal of the arsenic in the processed shale should include plans to prevent accumulation of the soluble arsenic at any point in the pile; that is, to achieve uniform distribution and prevent concentrated release from any accumulation that might by chance event become exposed. Furthermore, we believe the statement should consider other mitigating measures or other types of disposal of the arsenic in the event that the runoff water exceeds EPA criteria for potable water (0.05 mg/l), because streams of the area have periods of low or zero flow when concentrations in streamflow or in ground water receiving infiltration might cause degradation for considerable periods. As a result of the usual slow dispersion and dilution in ground water, detrimental effects to the human environment might be very long lasting.

We note the following typographical errors:

- (1) At the top of figure II-1, "R95W" and "R96W" should be reversed.
- (2) On page II-85, last paragraph, the range designation should be "R. ~~XX~~W."

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*Henry W. Calkins*  
Acting Director



#-27

The League of Women Voters of Colorado  
1375 Delaware Street, # 406  
Denver, CO. 80204  
303 - 571-1661

February 11, 1976

The Honorable Thomas S. Kleppe  
Secretary of Interior  
Department of Interior  
C Street & 18th Street, N.W.  
Washington, D.C. 20240

Mr. Curtis Berklund, Director  
Bureau of Land Management  
Department of Interior  
C Street & 18th Street, N.W.  
Washington, D.C. 20240

Dear Sirs:

The Draft Environmental Impact Statement entitled "Proposed Development of Oil Shale Resources by Colony Development Operation released December 12, 1975, by the Department of Interior and the Bureau of Land Management does not treat an active proposal as representatives of Colony Development Operation have publicly stated many times since October 4, 1974, that they have indefinitely suspended the proposed project.

The National Environmental Policy Act requires analysis of environmental impacts, cumulative impacts, mitigation measures and alternative courses of action. A critical component of a satisfactory analysis of these factors is the timing of a proposal. Without specific--or even general--information on this critical factor, neither can the lead agency analyze the specific and cumulative impacts, alternatives and mitigating measures, nor can the public and reviewing agencies come to a thorough understanding of the proposal and make substantive comments.

Thus, we question the issuing this EIS in the total absence of an active proposal with even a tentative time schedule and we request that no final EIS be prepared until such time as there is a definite time table for the project.

Sincerely yours,

*Marlene Wiske*

Marlene Wiske,  
President

*Tess McNulty*

Tess McNulty,  
Environmental Coordinator

- 2 -

27

cc: The Honorable Russell Peterson, Council on Environmental Quality  
The Honorable Jack O. Horton, Ass't Sec. of the Interior  
Senator Floyd Haskell  
Senator Gary Hart  
Representatives Pat Schroeder, James Johnson, Frank Evans, Tim Wirth,  
William Armstrong  
William Rogers, Department of the Interior Oil Shale Environmental  
Advisory Panel

A-6-50



#-28

28

## United States Department of the Interior

NATIONAL PARK SERVICE  
ROCKY MOUNTAIN REGIONAL OFFICE

655 Parfet Street

P.O. Box 25287

Denver, Colorado 80225

IN REPLY REFER TO:

L7619 (R/R)CS

FEB 23 1976

## Memorandum

To: State Director, Bureau of Land Management, Denver, Colorado

From: Regional Director, Rocky Mountain Region

Subject: Proposed Development of Oil Shale Resources DES 75/62

We have reviewed the subject document and submit the following comments:

The proposal will affect both Arches and Canyonlands National Parks and possibly Colorado National Monument. It will also affect the Wolfe (Turnbow) Cabin which is a historic site within Arches National Park and listed in the National Register of Historic Places. Our comments with regard to project impacts upon these areas are presented in the immediately following paragraphs.

Throughout the draft environmental impact statement the failure to indicate the recreational and esthetic values to be found in Arches and Canyonlands National Parks and possible effects on them by the proposal are conspicuous by their absence. These values and their related socioeconomic values and impacts to the States and counties involved should be a part of any analysis of impact on the Region.

No mention is made that preliminary wilderness proposals have been the subject of public hearings for Arches and Canyonlands National Parks (see enclosed copies of reports). Substantial portions of each area were proposed for wilderness designation and such designation would affect the use of these lands. Final proposals are in process of preparation for submission by the President to Congress. We suggest that the potential designation of these lands as wilderness and its effect on the proposal be reflected in the report.

A wilderness recommendation was submitted by the President to Congress for Colorado National Monument on February 8, 1976 (see attached report). No final action has been taken. The possibility of air contamination from the Colony Shale Development in the monument and its effect on wilderness quality should be addressed in the report.



The maps used in the draft environmental impact statement and appendix do not show the correct boundary for Arches National Park. Refer to maps in the enclosed wilderness report for correct boundary and relationship to Moab, Utah.

In Section III-52 mention is made of the Escalante-Dominquez Trail. There is a bill in Congress to add this trail to the National Trails System. As the pipeline would cross this trail, the effect should be addressed in the report.

Page IV-140: It is possible that an oil spill into the Colorado River may have some adverse impact on the bighorn sheep pasturing on parklands. We believe the extent of the impact would probably be minimal.

Arches National Park - Appendix 1

1. Figures 14 and 25 show an oil spill recovery site on Salt Wash at Wolfe (Turnbow) Cabin. The final statement should address the fact that this is a National Register property, establish what the impact of the project will be upon it, and how any adverse effects are to be mitigated.

2. Figures 14 and 25 designate two primary recovery sites within Arches: Wolfe Cabin and where the main park road crosses Courthouse Wash. The primary recovery sites should be outside the park and proposed wilderness so that spill entry into the park can be prevented if at all possible. Perhaps the problem is partly one of terminology, but there should be emphasis and planning to prevent oil spill entry into the park if at all possible.

3. Automatic gate valves should be considered on the pipeline at Courthouse Wash and at Sevenmile Canyon. This would effectively reduce the amount of spill and (a) prevent spill entry into the park, or (b) reduce the potential impact should spill entry occur.

4. There appears to be a discrepancy between the draft environmental statement, page V-5, and the Contingency Plan Appendix 1, page D-37 as to the type of valve to be used at the Colorado River crossing. In the draft environmental statement they are called automatic activated motor operated block valves.

Canyonlands National Park - Appendix 1

The park boundary should be indicated in Figure 17 for information purposes.

Pages D-38 and E-16: As in our comments regarding Arches National Park, we urge that any oil spill be intercepted before reaching the park if at all

A-6-51

possible, rather than leapfrogging back to Lathrop Canyon when interception is not feasible at the Potash area.

While it is true that small earth-moving equipment can be brought in via the Lathrop Canyon jeep road (see page E-20) the equipment cannot be utilized in the recovery operation without inflicting severe, long-term physical damage to the environment. We do not feel that the relatively short-term (though severe) impact of an oil spill would justify drastic alteration of the physical environment. In addition, the topography is such that valuable time would be lost in constructing access from Lathrop Canyon to the actual recovery site almost two miles upstream (see Figure 17.)

It is our belief that if any oil spill recovery is made below the Potash area, that land access will be of only very limited value and that helicopters and boats are going to be the only feasible means of access.

This being the case, we feel that any oil spill passing the Potash area should be intercepted as soon as possible. Preferably interception should occur before the spill reaches the park. If this is unavoidable, it should be intercepted as soon as possible thereafter, whether above or below Lathrop Canyon on the river.

There are as well many other concerns that we address below which relate to the impact the proposed project will have on the environment and the actions that should be taken to establish that adequate mitigating actions have been taken for the protection of cultural resources, which could be adversely affected by the project.

The draft environmental statement does not adequately address where the responsibility for maintaining the shale embankment and the settling pond dam resides; nor does it resolve the related problems that may arise upon conclusion of the project. The failure of the dam could have very serious consequences.

To the best of our knowledge, it has not been demonstrated that extensive vegetation can be grown on terrain comprising largely shale waste. Moreover, the presence of resulting unvegetated waste areas will require continued maintenance of the shale embankment.

Other questions as well of a like nature that the draft environmental statement fails to address include the following:

1. It is not clear what will become of the saline drainage waters or the pipeline itself at the end of the project.

2. With reference to the mining extraction method, it would seem that it would be aesthetically more beneficial to use more creative and natural landforms, rather than the room and pillar method. Such a method would not result in such a rigid landscape and permit greater flexibility in extracting from richer veins.
3. If there is not enough salvageable topsoil taken at the site, what are the alternative sites to be used to recover the reclaimed terrain?
4. There is cause to wonder whether there may be a problem with subsurface water. If this is so, what happens to the life of an aquifer if it is drastically cut as in the case of substantial earth removal?

Our review of the draft environmental statement with regard to the cultural resources that may be affected by the installation of the proposed pipeline suggests that many of our customary concerns have not been addressed as completely as would be desirable. This results in part from the fact that the proposed development plan is not completely clear on the matter of procedures that will be followed should unknown cultural resources be encountered within the pipeline right-of-way.

The statement also does not clearly confirm consultation with the State Historic Preservation Officers for the States involved. They are Mr. Stephen H. Hart, Chairman, State Historical Society, Colorado State Museum, 200 14th Avenue, Denver, Colorado 80203; and Dr. Melvin I. Smith, Director, Division of State History, 603 East South Temple, Salt Lake City, Utah 84102. The final environmental statement should reflect that they were consulted to determine whether the proposal will affect any cultural sites which may be in the process of nomination to the National Register of Historic Places and contain a copy of their responses.


The potential impacts upon archeological remains may indeed have been underestimated. The page IV-172 "Summary" for the preceding Cultural Values section does not establish how the positive impact will come about. That the pipeline construction may penetrate an archeological site and result in an increase in professional knowledge through the recovery of archeological artifacts is insufficient justification for following the proposed pipeline from Point (a) to Point (b). Recovery of such remains is considered to be a last resort after all other alternatives have been explored. Moreover, there are situations where it is regarded as better professional practice to leave such remains alone in an undisturbed state.

The draft statement suggests that too great reliance has been placed upon the inventories of cultural resources being made by the State Historic Preservation Officers for the States concerned. These are good as far as they go, but new sites are being continually added and it is generally recognized that they are far from complete. Likewise, we note that while the National Register of Historic Places was consulted, it was not the most recent listing.

Consequently, there is a need for further professional survey. It is not clear in the draft environmental statement whether the professional surveys made to date included the Davis Gulch disposal site, the Davis Gulch and Middle Fork dam and reservoir areas, and the railway construction locations with their associated right-of-ways. If they have not been surveyed, this should be done prior to the preparation of the final environmental statement. The final statement should detail the results of the professional surveys and include the comments and recommendations of the investigations.

There is as well a need to evaluate all known cultural resources as well as others identified in the course of the professional surveys. Page III-52 identifies the Uintah Narrow Gauge Railroad grade. There are also references to other sites of potential cultural significance. In accordance with Executive Order 11593, Section 2(b) requirements, all of these sites should be evaluated for possible inclusion in the National Register of Historic Places.

The identification of significant resources will necessarily require compliance with Section 106 of the National Historic Preservation Act of 1966, and the Advisory Council on Historic Preservation "Procedures for the Protection of Historic and Cultural Properties" (36 CFR, Part 800) in the further development of this project.

  
Deputy Regional Director  
for Lynn H. Thompson

Enclosures 3



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

MAILING ADDRESS  
UNITED STATES COAST GUARD (C-NS/73)  
WASHINGTON, D.C. 20540  
PHONE (202) 426-2262

#-29

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Colorado State Office  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

This is in response to your letter of 16 December 1975 addressed to the Coast Guard Office of Marine Environment and Systems concerning a draft environmental statement for the proposed development of oil shale resources by the Colony Development Operation.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. The Coast Guard had the following comments to offer:

"Page A-2: change the Coast Guard's phone number to 314-425-4614 and add National Response Center 800-424-8802."

"The use of chemical agents (dispersants and collectors) should be reconsidered with the requirements of the National Contingency Plan (p. 2002.2, 2002.3 and 2003.)."

The Office of Pipeline Safety Operations commented as follows:

"On page II-7, sixth paragraph, correct to read, 'The pipeline must be designed, constructed, operated, and maintained in accordance with regulations promulgated by the Department of Transportation (DOT), Materials Transportation Bureau (MTB), Office of Pipeline Safety Operations (OPSO), (49 CFR 195).' This is an updating in line with the reorganization of pipeline safety responsibilities in the Department."

"The second sentence, last paragraph, on page II-86 should be changed to read, 'Interstate pipeline safety standards are set by regulations of the Materials Transportation Bureau, Office of Pipeline Safety Operations, (49 CFR 195); ....'

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"There is a typographical error in the Table II-28 -- the wall thickness shown for the first section of pipe apparently should read 0.375."

"On page IV-89, accident data and volumes of liquid lost from pipeline accidents are available for the year 1974 from the OPSO which would provide more current figures; however, the new data would not significantly affect conclusions shown on this page."


"On page V-6, at the end of the first sentence, third paragraph, add 'Part 195' following Chapter I. Similarly, add 'Part 195' following Chapter I in last sentence on page V-7."

"On page V-28, update DOT reference including MTB and OPSO rather than OPS."

The Department of Transportation has no other comments to offer nor do we have any objection to this project. The final statement, however, should address the concerns of the Coast Guard and the Office of Pipeline Safety Operations.

The opportunity to review this draft statement is appreciated.

Sincerely,



Dale R. Andrus  
State Director  
Bureau of Land Management

A-6-54



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20201

#-30

DEPT. OF INTERIOR  
BUREAU OF LAND MANAGEMENT  
COLORADO STATE OFFICE, DENVER

76 MAR 1 AM 10:00

FEB 25 1976

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Department of the Interior  
Colorado State Office  
Room 700, Colorado State Bank  
Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

We have reviewed the draft Environmental Impact Statement concerning the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado.

Occupational health considerations are important limiting factors in the realization of this project, especially for those workers employed at the site. A systematic assessment of the safeguards which will be employed to ameliorate any mitigating measures should be elaborated upon in the final document. Listed below are instances where we note occupational health hazards may exist:

1. The production of 800 short tons of coke per day, unless adequately controlled, would pose a definite health risk to workers as a result of particulates emitted to the atmosphere by the production process;
2. Nitrogen oxide emissions from diesel engines at 250 lbs/hr inside the mine would result in peak hourly airborne concentrations of up to 40,000 ug/m<sup>3</sup> or 20 ppm. This is extraordinarily high and would represent an unquestioned risk to human health. During blasting peak hourly particulate loadings of 40,000 ug/m<sup>3</sup> in the mine would also be unacceptably high;
3. Fugitive emissions from crushing operations are not adequately controlled. These emissions could contain silica, carcinogens and a number of trace metals. Unfortunately, relatively little is known about the health hazards of raw shale;
4. Pyrolysis of the raw oil shale into hydrocarbon vapors and liquids could lead to health conditions hazardous to human health.;

Page 2 - Mr. Dale R. Andrus

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5. The simultaneous presence of amines as well as nitrogen oxides in the pyrolysis process could lead to the formation of nitrosamines, a potentially very potent class of carcinogens;
6. No consideration is given in the document of the possible health implications of H<sub>2</sub>S generated during pyrolysis. Also, the emissions of H<sub>2</sub>S from the sulfur recovery unit could pose a health risk to workers;
7. The potential toxicity of the cobalt molybdate and nickel based catalysts for workers should be assessed;
8. Arsenic removal of 531 lbs per day from the feed to the gas oil hydrogenation unit and at 59 lbs per day from the naphtha hydrogenation unit which are to be deposited in solid by dump trucks could pose an occupational hazard. There is a possibility that this arsenic could contain trivalent forms;
9. The delayed coker unit which converts the heavy bottom oil from the pyrolysis and oil recovery units into lighter products and by-product coke by thermal cracking could be an especially troublesome occupational health problem unless properly controlled;
10. Concentrations of contaminants in the workplace were not adequately considered. The primary concern for air quality was directed at the ambient air;
11. The construction phase of the shale oil pipeline was not evaluated with respect to possible occupational health hazards; and
12. No assessment is provided of the possible safeguards for dangerous noise levels.

The effects of discharging waste water into the Colorado River should be assessed with respect to salinity and the implications for potential impacts occurring as a result of using the water for crop irrigation or drinking by animals.

A-6-55

Page 3 - Mr. Dale R. Andrus

Finally, the statement does not discuss the possible alternative of utilizing nuclear energy as a source of power in lieu of a fossil fuel.

Sincerely,

*Charles Custard*

Charles Custard  
Director  
Office of Environmental Affairs

#-31

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII  
1860 LINCOLN STREET  
DENVER COLORADO 80203

76 MAR 2 A10: 01

MAR 1 1976

DEPT. OF AGRICULTURE  
BUREAU OF LAND MANAGEMENT  
COLORADO STATE OFFICE DENVER

Ref: 8W-EE

Mr. Dale R. Andrus  
Bureau of Land Management  
1600 Broadway, Room 700  
Denver, Colorado 80202

Dear Mr. Andrus:

My staff of the Region VIII office of the Environmental Protection Agency has reviewed the draft environmental impact statement for the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado.

EPA believes the draft EIS presented by BLM is a well documented impartial analysis of the potential impacts of the proposed oil shale mine and plant complex. I hope these comments and the additional information generated by our requests, can aid your staff in preparing the final EIS and in encouraging Colony to change some aspects of their proposal to better protect the environment of the project area.

Colony may need to alter its facility design somewhat to meet the following regulations adopted by EPA regarding air quality: 1) Compliance with the ambient increments for particulates and SO<sub>2</sub> for Class II standards under the Prevention of Significant Air Quality Deterioration Regulations and 2) Compliance with Standards of Performance for New Stationary Sources for Petroleum Refineries and Storage Vessels.

Under the Prevention of Significant Deterioration Regulations adopted December 5, 1974, EPA has set standards for the country defining allowable increments of particulates and sulfur dioxide gas. This facility will be subject to these regulations as a fuel conversion plant, which is category 18 of 40 CFR 52.21(d). As a consequence of our review of the EIS, EPA believes there is the potential for violation of the 24-hour particulate Class II standards. Whether or not the plant would in fact violate these standards will be the subject of a thorough review by EPA once the company submits an application under these regulations.

Page 2

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The modeling performed and emission factors used by the company will be carefully reviewed at that time and EPA will independently conduct air quality diffusion modeling if necessary to determine compliance with these standards. It is noted that Colony's particulate emission estimates do not include fugitive dust emissions. All point source emissions as well as fugitive dust, i.e. dust from construction areas, transportation induced dust, and dust from the spent shale pile, should be included in the emission estimates to determine ambient concentrations. In addition, Colony should define what mitigating measures will be taken to reduce these dust emissions. See our detailed comments for further discussion.

The promulgated standards (40 CFR Part 60) for petroleum refineries limit emissions of sulfur dioxide from fuel gas combustion systems. The project as proposed appears to meet these standards. The same regulations require storage vessels for petroleum liquids of the type vessel proposed here to have a floating roof in order to reduce hydrocarbon emissions. Colony will need to install floating roofs on its storage vessels at both the plant site and the Lisbon Valley terminal.

There are major unresolved questions regarding the ability and commitment of Colony to provide for long-term maintenance of the spent shale pile after mining ceases. The company plans to replace top soil only on one-fourth of the 800 acre spent shale pile. Most studies to date indicate the unlikely success of revegetation on pure TOSCO shale. Company plans to dismantle the Davis Gulch Dam if not sold would allow contaminated runoff from the disposal area to enter the Colorado River system.

In spite of this hazard, the company proposal does not include plans to monitor ground water quality and pile stability to provide data on the extent of this potentially major water quality problem. EPA strongly suggests that the company install near or on the spent shale disposal area ground water monitoring wells, potentiometers and strain gages to check the level of pollutants, their mobility and pile stability. Further, it is highly recommended that the company prepare an abandonment plan, to be updated as the state of the art improves, outlining measures to assure that no major adverse pollutant loading will occur at the end of mining. This potential source of water contamination may be subject to state or Federal NPDES permit requirements in the future.

EPA cannot emphasize the seriousness of the pile stabilization problem strongly enough and therefore EPA strongly suggests its recommendations to monitor the problem and to prepare a mine abandonment plan be adopted by the Colony Development Operation.

Page 3

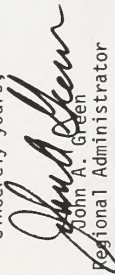
My staff is pleased with the inclusion by BLM of the energy input-output calculations contained in the EIS. EPA promotes the use of such comparative data to allow the dialogue to continue on oil shale's place regarding the nation's energy production.

EPA wishes to commend BLM for the environmentally sound provisions they have included for pipeline right-of-way restoration. Immediate top soil replacement, revegetation with native species, and mulching with chipped vegetation are excellent methods of reclaiming the right-of-way and should be particularly beneficial across the Roan Plateau.

Although there is uncertainty about current company plans, there is sound logic in reviewing this proposal at this time. The additional time between EIS review and implementation, provides time for local officials to plan and time for government agencies to adequately respond to the questions raised during this review. EPA requests that if major changes in the state of the art of environmental impact mitigation or if additional industrialization of the region significantly changes the water and air resource situation, a supplementary EIS be prepared to analyze any of these new major issues prior to Colony proceeding with its development.

According to the procedures EPA has adopted to rate the environmental impact of a proposed action, the draft EIS for the Colony Development Operation will be listed in the Federal Register in Category ER-2. This means EPA has environmental reservations regarding compliance with air standards, monitoring and mine abandonment plans, and requests additional information as outlined in our attached detailed comments. Thank you for the opportunity to review this proposal at an early date, and may I suggest that due to the numerous details presented in EPA's comments your staff and mine get together with company officials to discuss these comments at your convenience.

Sincerely yours,



John A. Green  
Regional Administrator

Detailed Comments by the  
Environmental Protection Agency  
on the Draft Environmental Impact Statement  
For the Proposed Development  
Of Oil Shale Resources by the  
Colony Development Operation  
in Colorado

#### Air Quality Impacts

##### Federal Actions Involving EPA

The list of federal actions required to implement this proposal needs to be expanded to include the following regulatory requirements promulgated by EPA:

- 1) Compliance with the Prevention of Significant Air Quality Deterioration Regulations Class II standards adopted December 5, 1974. (40 CFR Part 52)
- 2) Compliance with Standards of Performance for New Stationary Sources under the Petroleum Refinery category and under the Storage Vessels for Petroleum Liquids category, adopted March 8, 1974. (40 CFR Part 60) (Copies of these regulations are enclosed)

Under the Prevention of Significant Deterioration (PSD) Regulations adopted December 5, 1974, EPA has set standards for the country defining allowable increments of particulates and sulfur dioxide gas. This facility will be subject to these regulations as a Fuel Conversion Plant, which is category 18 of 40 CFR 52.21(d). The present standards for this area and all regions of the country are the Class II standards which define allowable increments of pollutants above existing background conditions. Therefore, the EIS must address the facility's ability to meet these PSD increments as follows:

Pollutant	Class II ug/m <sup>3</sup>
Particulate matter annual geometric mean 24-hour maximum	10 30
Sulfur Dioxide annual arithmetic mean 24-hour maximum 3-hour maximum	15 100 700

As a consequence of our review of the EIS, EPA believes there is the potential for violation of the 24-hour particulate Class II standard.

Whether or not the plant would in fact violate these standards will be the subject of a thorough review by EPA once the company submits an application to us under the provisions of these regulations. The modeling performed and emission factors used by the company will be carefully reviewed at that time and EPA will independently conduct air quality diffusion computer modeling if necessary to determine compliance with these standards. Colony's particulate emission estimates do not include fugitive dust emissions. All point source emissions as well as fugitive dust, i.e. dust from construction areas, transportation induced dust, and dust from the spent shale pile, should be included in the emission estimates to determine ambient concentrations. Inclusion of fugitive dust emissions will make it more difficult for the facility to meet these air quality requirements.

Fugitive dust emission factors are included in Chapter IV, but this has not been carried through to determine estimates of particulate concentrations. While dust produced from construction activities may be excessive it will be temporary. Also, transportation induced dust will probably be highest during the construction period and then be somewhat reduced as activity is reduced and permanent roads are covered. Mitigating measures to reduce these sources should be determined by Colony and identified in the impact statement.

EPA is primarily concerned about dust emissions from the spent shale pile during placement of these tailings. This major source of fine windblown particulates has not been quantified nor even estimated. It is this source of dust that should be included with plant emissions to determine worst case conditions for plant operations. Colony's method of reducing these emissions should be analyzed in the final EIS.

New Source Performance Standards (NSPS) have been adopted by EPA for petroleum refineries and storage vessels for petroleum liquids. Process heaters, boilers, and flares at the plant are subject to these NSPS under the petroleum refineries category. The promulgated standards for petroleum refineries limit emissions of sulfur dioxide from fuel gas combustions systems. Any fuel gas which contains  $H_2S$  in excess of  $230 \text{ mg/dscm}$  ( $0.10 \text{ gr/dscf}$ ) shall not be burned in a fuel gas combustion device. The operation may elect to treat the gases resulting from the combustion of these fuel gases to limit  $SO_2$  release to the atmosphere equal to the above. The combustion of process upset gases in flare systems is exempted.

The promulgated NSPS also apply to storage vessels with capacities greater than 40,000 gallons that contain crude petroleum condensate, or finished or intermediate products of a petroleum refinery. To reduce emissions of hydrocarbons to the atmosphere, a vapor recovery system or equivalent control is required if the stored liquid has a true vapor pressure, under storage conditions, greater than 570 millimeters of

mercury ( $\text{mm Hg}$ ); and a floating roof or equivalent control is required if the stored liquid's pressure is between 78 and 570  $\text{mm Hg}$ , inclusive. (See the Friday, March 8, 1974 Federal Register pages 9303 to 9323). As a consequence of these regulations the on-site storage vessels and the 120,000 gallon Lisbon Valley storage tank will need a floating roof to reduce hydrocarbon emissions.

Additionally, information regarding air quality modeling efforts done by Colony are not fully described in the EIS. In order to evaluate the validity of this modeling, EPA requests a complete description of the Battelle Northwest modified gaussian plume model which was used for this effort. A description of assumptions used in the model would aid our review of the EIS. Pages IV-31 and IV-32 suggest that because of a modeling uncertainty factor of 2, predicted ambient concentrations could be less than indicated. It further states that because of this uncertainty, the predicted concentrations are reduced, therefore concluding that no violations of the State air quality standards will occur. Using this reasoning the predicting concentrations could also be doubled based on this uncertainty as it implies a plus or minus confidence factor.

#### Water Quality Impacts

Water quality effects have been reduced by inclusion of the BLM provisions on pipeline right-of-way reclamation procedures. EPA is pleased that such provisions as top soil replacement, reseeding, and mulching with chirped vegetation will be required along this right-of-way. Additional provisions to treat the flow and to reduce erosional effects from the water released during hydrostatic testing of the pipeline will greatly reduce these effects. Colony's proposal to place automatic shut off valves activated by pressure drop on either side of the Colorado River is commended. However the impacts on water quality related to the plant complex itself are potentially serious and should receive further analysis and the inclusion of mitigating measures where necessary. These impacts range from the short term problem of the effects of site preparation to the long term problems of the impact of mining and shale disposal on surface waters.

#### Impacts on Surface Water Quality

A major deficiency of this proposal is the lack of plans by Colony which would provide for long-term maintenance of the spent shale pile. There are major unresolved questions regarding the ability and commitment of Colony to provide for this long-term maintenance after mining ceases. The company plans to replace top soil only on one-fourth of the 800 acre spent shale pile. Most studies to date indicate the unlikely success of revegetation on TOSCO shale with minimal soil cover. Company plans to discontinue the Davis Gulch Dam if not sold would allow contaminated runoff from the disposal area to enter the Colorado River system.

The question of whether or not the spent shale disposal area can be revegetated is a crucial one in terms of water quality, air quality, aesthetics, wildlife habitat and the long-term productivity of the area to be disturbed. Although considerable progress has been made in identifying some of the constraints on establishing vegetation in a hostile environment, we are not aware of any technique that can promise establishment of a satisfactory plant community under the conditions described in the EIS. While the environmental statement acknowledges that the task of revegetation of the spent shale pile will be a difficult one, it does not describe the approach that will be taken in attempting to solve the problem, the level of commitment that the company has to successful revegetation on the site, or what Colony considers to be an acceptable level of rehabilitation.

Although the plan for controlling erosion by structural methods on the spent shale pile is sound, (e.g. diversion structures, lateral drains, benches, etc.), the probability for erosion control by vegetative growth appears low. Research results with respect to vegetative stabilization on TUSCO II spent shale indicate limited success. Given the fineness of the materials, a south facing slope, and salt migration via the capillary action, successful revegetation does not appear promising. Also, given that Colony is "not committed to covering the entire pile with topsoil" (only 200 of the 800 acres), this essentially represents little commitment by the company to successfully revegetate 75% of the spent shale pile. Although Colony is committed to "continued seeding," given the lack of a plant receptive medium, sustained vegetative growth appears unlikely.

The shale disposal area is situated on a south and southeast facing slope, and this will be exposed to strong solar radiation throughout the year. Most authorities on oil shale revegetation recommend against such exposure because of intense heating and dehydration of the seed bed, greater potential for resalinization of leached horizons, and greatly decreased soil infiltration rates due to dehydration of the surface. Surface temperatures as high as 1700 F have been reported, and temperatures in the 1500 - 1550 F range are common on the highly absorptive black surface of bare spent shale with southern exposure. Southern exposure may also enhance capillary rise sufficiently to cause formation of surface deposits of salts which reduce the soil infiltration capacity to near zero, thus greatly increasing the potential for surface runoff and serious erosion of the shale.

Another serious water quality question is the fate of the dams, especially the Davis Gulch structure, after the plant ceases to operate. If the dams are simply abandoned or dismantled serious water quality impacts will almost surely result.

Additional information needed to evaluate the effects on surface water quality includes the following:

1. The projected salinity increase of 0.12 mg/l at Hoover Dam as a consequence of project development should be reviewed. The associated economic loss due to this salinity increase of \$240,000 per mg/l increase to downstream users should be addressed in the final EIS. The 0.12 mg/l projected increase was based upon a withdrawal from the Colorado River of 10 cfs rather than 12.5 cfs as now proposed. Flow reductions in Parachute Creek due to construction of Davis Gulch and Middle Fork Dams and flow reductions as a result of eliminating springs and seeps due to mining activities should be factored into the salinity calculation. An effort should be made to utilize more current salinity concentration information for Hoover Dam and the point of intake water diversion.
2. It also appears that the TDS level in Parachute Creek and thus in the Colorado River would increase due to uncontrolled runoff from the plant site, mine bench, possible power substation site, access roads, etc. Thus some attempt should be made to quantify the increase in TDS and factor it into the calculated salinity increase at Hoover Dam.
3. The design of the Davis Gulch structure should be of sufficient capacity to impound all runoff. The EIS indicates that this structure will be designed for the maximum probable thunderstorm of one hour duration. This is no doubt the situation for the maximum case of rainfall; however, it may not be the situation for the maximum runoff condition. A fast, large snow melt caused by a long, slow spring rain with saturated soil conditions could easily be the maximum runoff case. What is the maximum runoff situation?
4. The size and location of the surge and guard ponds are not specified. Will they be adequate to prevent any overflow that could result from the maximum probable rainfall?
5. Will any mulching, netting, fertilizers, or supplemental irrigation water, as used on Colony's present revegetation plots, be used in the disposal pile?
6. The EIS states that "Experiments are currently being conducted on the process shale containing representative quantities of mass catalyst material and test bins constructed to simulate

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the actual embankment, including representative depth and compaction densities. The reference for these experiments is written communication, however if this is a reference to the Metcalf and Eddy Study (Water Pollution Potential from Surface Disposal of Processed Oil Shale from the 10806 11 Process, October, 1975) some discrepancies exist. The compaction densities used in the Metcalf and Eddy study are similar but no catalyst was placed in the spent shale (at least this addition was not mentioned) and the depth of the test bins was only 4.5 feet. Are studies using the spent shale and catalyst material contemplated? Are there any studies on spent shale rehabilitation using relatively deep piles?

7. Further explanation of the reclamation plan regarding the sequence on shale placement is needed. For example, where will the disposal operation start, how will it proceed, what will be the configuration of the pile after 10 years? The method and sequence of the leachate effort to reduce salt levels should also be specified.

8. The following subjects with respect to stability of the pile should also be addressed; the potential for slurry material to create a slump failure surface. Flow type failure and slumping potential for failing along contact between pile and original surface and long-term stability.

9. More information and discussion is needed with regard to the effect of mass movements on the process shale pile and also how the long-term effects of subsidence might affect the drains and catchment dams.

10. The proposed design of the river water intake structure should be defined. An EPA document concerning water intake structures recommends against channel intake structures since non-swimming fauna are easily taken into the pump. An alternative is the bank intake design whereby the stream velocity is maintained past such weirs, allowing most non-swimmers to be swept downstream by the current. (See "Development Document for Proposed Best Technology Available for Minimizing Adverse Environmental Impact of Cooling Water Intake Structures" EPA 450/1-74/015).

11. Figure 11-22 shows an increase from 70 gpm to 750 gpm after 12 years for revegetation with no apparent increase in water diversions. What is the source of this additional water supply?

12. The channel alterations that will be made on 20' of the length of Parachute Creek between the confluence of Middle Fork and East Middle Fork Creeks and the Colorado River should be discussed in

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greater detail (see pp IV-55 - IV-56) and their impacts on water quality and aquatic life should be discussed.

#### Effects on Ground Water Quality

The potential for contaminated waters to reach aquifers as a result of leachates moving through the spent shale pile is high. The EIS indicates water quality values for blended processed shale using distilled water. The conclusion is that actual concentrations will be lower than these values due to reduced particle - fluid contact and prior leaching of the shale. Reduction of compaction due to freeze-thaw cycle erosion; and the addition of very poor quality process waters, would indicate that the leachate could be very high in total dissolved solids. Therefore leaching of water contaminants is possible especially through the thinner areas of the spent shale pile at the edges and at the toe of the embankment. The leachate will be of extremely poor quality with a total dissolved solid TDS concentration as high as 40,000 mg/l.

It is stated on page IV-59 that development of a 4100 acre mine will substantially impact aquifers located in the Uinta Formation and Parachute Creek Members of the Green River Formation. Mine dewatering is indicated but quality, quantity and point of discharge are not addressed. The Metcalf and Eddy report noted that springs and seeps in Davis Gulch would be capped and diverted to prevent water entrance to the side or bottom of the pile. No mention is made of this activity in the EIS. Such structures are needed to prevent piping erosion of the pile and to reduce potential for groundwater contamination. Is this part of Colony's proposal?

Additional information needed to evaluate effects on the groundwater system include the following:

1. More hydrologic information is needed in the Davis Gulch area, more than a generalized hydrologic cross-section of Piceance Basin. The effects of mining on groundwater levels and quality in Davis Gulch and the Middle Fork Creek should be addressed. The hydrological relationship between the mining zone, and Davis Gulch and Parachute Creek should be indicated.
2. Does a natural barrier exist beneath the Davis Gulch and Middle Fork Dams and under the spent shale pile that will prevent the movement of contaminated water into the groundwater? If a barrier does not exist, will any action be taken to prevent seepage?

EPA Recommendations to Protect Water Quality

The water quality problems detailed in the previous section are a result of runoff which is generally non-point in nature and ground water leachate problems. However, because this runoff is from a confined, discrete area (spent shale pile) which is ultimately associated with an industrial source, IDDES permit requirements may apply. EPA believes they are potentially serious and control measures should be addressed prior to IDDES approving rights-of-way for the pipeline for this facility. Consequently, EPA recommends the following mitigating measures be adopted.

1. Preparation of Mine Abandonment Plan.

This plan would describe Colony's commitment to prevent serious water quality degradation to the Colorado River as a result of contaminated runoff escaping from the Davis Gulch disposal area. This abandonment plan, which should be updated as the state of the art improves, should include the following:

- a. Detailed information on how the company plans to go about vegetating the spent shale, including costs, schedules, seed bed preparation, types and sources of seeds and nursery stock, amount and management of irrigation, and information on any soil amendments such as fertilizers and mulches that may be used. Consideration should be given to using available organic materials (such as sewage sludge, sediment material from settling ponds and chipped vegetation from disturbed areas) on the spent shale as mulch. This plan should also include information on what actions might be taken in the event that Colony's goal of establishing a self-regenerating plant community cannot be attained.
- b. The abandonment plans should exclude the possibility that if the Davis Gulch Dam cannot be sold it would be dismantled. The removal of such a dam would have serious effects in terms of the water quality of downstream water resources and aquatic and terrestrial organisms. The structural integrity of the dams and embankment by proper maintenance over the long-term must be assured. The plan should describe what organization will be responsible for this long-term maintenance.
2. Installation of Water Quality and Structural Monitoring Devices. In addition to the surface monitoring stations on Parachute Creek, EPA believes the following items of monitoring equipment are necessary to provide data on the effects of this operation.
  - a. A network of groundwater wells for sampling water quality and obtaining water level measurements should be developed both

upgradient and down gradient of the mining area. Even if the present system is continued the number of stations and wells should be expanded to adequately assess all sources of contaminants. An aquifer test is needed to determine the amount of water, its quality, geologic location and effects of mining. Regarding a well monitoring system for the spent shale disposal site, requirements of the Federal Leasing program include a minimum of three observation wells for each such area, one up gradient and two down gradient. We feel the BLM should urge the company to drill these wells in order to monitor the movement of heavy metal and other contaminants which can move out of the shale disposal area.

- b. Regarding the spent shale pile, the following represents some monitoring methods which might be installed:

- moisture probes (e.g., tensionimeters)
- salinity sensors
- temperature devices (thermography)
- structural monitoring
- embankment piezometers
- visual inspection
- log of spent shale characteristics
- inclinometers
- benchmarks
- seepage flow measurements
- settlement rods
- pressure cells

- c. In regard to which elements should be analyzed, we find the list of parameters presented in Colony's report to be fairly complete. However, EPA requests that both radiological and biological parameters be added. Gross alpha and beta should suffice to arrive at radiological contaminants, but if those measures are sufficiently high then a test should be run for U, Th, and Ra 226. Fecal coliform and fecal streptococcus should also be sampled as well as benthic life forms in the perennial streams.

Alternatives Analysis

Reevaluation of alternative analysis for various aspects of this plant, might include the following:

1. In regards to the need for 100 MW of power, the Public Service of Colorado Study, Appendix 11, states that the Cameo Power Plant cannot supply the required power and meet existing demands. Thus, the present grid system may be energy short, and added electrical demand which would result from the proposed action would probably require additional generating capacity. That situation needs to be examined in some detail.
2. Is there any relationship among the possible powerline routes to the proposed Occidental plant site that BLM and Public Service of Colorado are evaluating and those routes proposed by Colony?

3. It appears that a more detailed examination of the mine backfilling alternative is warranted. Further examination of this alternative is merited given that 1) revegetation appears problematical, 2) a reduction of spent shale which must be disposed of on land is desirable, and 3) probable increased recovery rates and reduced subsidence potential are advantages if properly compacted or hardening material is added. Also, "phased" backfilling, although presenting a handling problem, appears desirable. The EIS states that backfilling will cause groundwater problems and that leachates will "probably" reach Parachute Creek. This is in conflict with the description of groundwater contamination potential due to the proposed mining method.

4. An alternative design for the spent shale pile should include the installation of some sort of "capillary barrier" to block the upward migration of salts brought about by surface evaporation. Research has suggested that such a barrier may be a prerequisite for successful revegetation on spent shale.

5. Alternative embankment designs (rather than just spent shale at 95 PCF) should receive consideration and stability analyses should be performed; for example, rock riprap on the embankment face if more resistant to erosion and is better with respect to water quality in the effluent; although it may be less aesthetic. Why wasn't this alternative chosen?

6. The capacity of the 16-inch pipeline is sufficient to allow an increase of from 50,000 BPD to 150,000 BPD with additional pumping volume according to the EIS. However, in order to use this increased capacity, the connecting 10-inch line would have to be addressed in the final statement.

7. An alternative which was neglected in the EIS was the separate treatment of wastes, other than coke, besides disposal in the processed shale pile. Alternative methods of disposal for such wastes as spent catalysts, arsenic, sludge, lime sludge, zeolite generating wastes, boiler and cooling blowdowns, etc., should be discussed in a definitive manner. Solid waste disposal of spent catalyst material poses the major problem of confining these toxic heavy metals to the area. We recommend that the alternative of commercial processing of all catalysts be carefully considered to mitigate this potential hazard.

#### Secondary Impacts on Local Communities

The Environmental Protection Agency commented on Colony's environmental impact analysis on September 6, 1974, regarding resolution of some of the issues this industrial growth will create. EPA said at the time, "some of the growth issues which need to be resolved in order to provide for orderly development include: development of a plan to provide front-end money to communities, land use controls along the narrow river valley, expansion of sewage treatment facilities, need for mass transit of company employees to the plant, new housing construction plans, and the problem of increased pressure on public lands. All this should be coordinated with the local communities and communities involved and the Colorado West Council of Governments. The draft EIS should cover the above sources of impact, their mitigation, comprehensive planning, and coordination between Federal, State and local agencies."

These issues are unresolved according to the EIS, therefore EPA suggests that once Colony is sure of its construction schedule, the company should work with the communities involved, particularly Grand Valley, to determine solutions to these community needs.

The EIS does not make clear what type of subdivision development is proposed for Battlement Mesa. Table IV-36 indicates 1025 people will settle on Battlement Mesa yet there is no indication of the type of housing or what community services would be included. The EIS states on page II-98 that this new development would "include motels, shopping centers, schools, etc." Such statements are not very definitive, therefore the final EIS should include some specifics of the Battlement Mesa development. The population multiplier used to define total induced population should be increased from 2.5 to 3 as noted on page IV-193, thereby increasing expected total population from 4100 to 6150.

The irretrievable loss of four rare, endangered, or unique species of plants from the project area due to alteration of springflows and seeps is disturbing, especially in view of the potential that similar projects such as Union Oil's proposed development threaten to eliminate these species from other nearby areas. The extinction of any of these species may be unnecessary and some means of protecting them could be taken.

The power requirements for the Grand Valley site are not addressed nor are the impacts of that requirement.

Finally the interrelationship if known between Colony and Union Oil's proposed project in relation to the effect on the local communities could be described in brief terms in the final EIS.

Review of the Oil Spill Contingency and Response Plan for A Proposed Pipeline System

Generally, this Contingency and Response Plan is sufficient to allow adequate response to accidental discharges of oil from the proposed pipeline system. We are pleased to see the inclusion of automatic shut-off valves on both sides of the Colorado River. Major leak detection by pressure drop would appear to be sufficient. Minor leak detection by flow differences may be a problem as these instruments are generally only accurate to around three percent of measured flow. The accuracy and calibration of this equipment should be defined in the final statement. Most of the following comments regard updating the plan.

1. Page 14, lower half, item (1): should reference the National Oil and Hazardous Substances Pollution Contingency Plan, February 10, 1975.
2. Page 14, lower half, item (2): should reference the Region VIII Oil and Hazardous Substances Pollution Contingency Plan, June 25, 1975.
3. Page 15, list of Response Centers: should include U.S. Coast Guard-Pacific Strike Team (PST), San Francisco, California.
4. Page 16-19, "Summary of applicable items from EPA's Region VIII Plan." Although most of the referenced narrative is accurate, the author may wish to change it somewhat to reflect specific items which were modified in the Region VIII 1975 edition.
5. Page 28, Section a. Renotifying ...: The Regional Office encourages reporting of all spills of oil or hazardous substances even though water contact is not established or anticipated. This establishes routine, promotes communication, and prevents later confusion in case unforeseen circumstances cause an accidental discharge to become a spill which requires mandatory notification after water contact.
6. Page 28, items 1, 2 and 3: should read  
EPA Region VIII Emergency Response Team - (303) 837-3880 (24-hour)  
Colorado department of Health -- Denver - (303) 388-6111, X231 (Duty hours) (303) 366-5363 (After hours)

Utah State Division of Health - (801) 533-6145 (24-hour)

Add:

U.S.C.G. - National Response Center  
(800) 424-8802 (24-hour - Toll free)

7. Page 34, Fig. 3: Heading should read "EPA Region VIII," not "Region VII."
8. Page 45-46: In order to conform to wording in applicable Federal Regulations, spill size should be quoted in gallons, not in barrels according to the following:  
small - less than 1,000 gallons into water  
medium - 1,000 gallons to 10,000 gallons into water  
major - more than 10,000 gallons into water
9. Page 51, last two lines: As a general rule, use of chemicals at the site of an oil spill is prohibited. The only general exceptions to this rule is for chemicals used by responsible firefighting crews for fire or flash point/vaporization suppression, or wicking or igniting agents used at the time of burn off.  
Any other use of chemicals to control or mitigate the effects of an accidental spill shall be after the approval of and at the direction of the EPA.
10. Page 54, paragraph d. Dispersants:  
See above.
11. Page A-1, EPA: Alternate 24-hour Oil and Hazardous Material Spill Reporting - USCG-NPC (800) 424-8802 (24-hour - Toll free).  
Regional Emergency Coordinator  
C. Alvin Yorke (303) 837-2468 (Duty hours)
12. Appendix A: Generally update names and phone numbers for agency contacts, particularly Utah State offices which have a new 533 phone prefix, and after-hours Colorado State government contact phone number of (303) 366-5363.
13. Appendix B: May wish to include Utah and Colorado State Highway Departments as possible sources of response equipment.
14. Page B-4, i(4): See number 9.

15. Page C-3, Table 3: Substitute "H" descriptor in all boxes under columns labeled Chemical Dispersants, \*Non-Toxic Chemical Collectors, Sinking Agents and Agitation.

\*Other than commercial sorbent material specially designed for removal of oil from water and which can be entirely recovered for proper disposal.

16. Page C-6, second paragraph: Burning or burial of cleanup debris will be accomplished after consultation with appropriate State Health Department officials.

Although not mentioned in this document and not directly pertaining to the pipeline transport system, the company will need to address 40 CFR, subchapter D, Part 112 - Oil Pollution Prevention for Non-transportation Related Onshore and Offshore Facilities, December 11, 1973.

Briefly stated, a non-transportation related onshore facility falls under the province of these regulations if it meets the following criteria:

1. Aggregate total facility storage of oil (as defined by Federal law) in quantities in excess of 1320 gallons above ground or 42,000 gallons below ground and,
2. Situated such that a facility discharge could reasonably be expected to reach flowing water (disregarding any man-made structures).

Although these regulations would not directly impact the integrated pipeline system (being transportation related) various components of any terminal facility plus extraction, processing and/or storage units may.

Any applicable facility must have a Spill Prevention Control and Countermeasure plan (SPCC Plan), a separate and distinct document, prepared for that facility within six (6) months after facility start-up. Any spill containment, control or countermeasure features identified in the SPCC Plan must be incorporated into the facility within twelve (12) months after facility startup.

Another set of Federal Regulations which do not now apply but may have future impact on the proposed facility is 40 CFR, sub-chapter D, Part 116, Destination and Determination of Removability of Hazardous Substances from Water - Notice of Proposed Rulemaking, December 30, 1975. This list includes ammonia and sulfur as hazardous materials and hence these substances may be subject to regulatory controls once the regulations are adopted.



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DEPT OF INTERIOR  
ASSISTANT SECRETARY OF DEFENSE  
COLD STATE OFFICE, DENVER  
WASHINGTON, D. C. 20301

76 MAR 3 AM 10:00

HEALTH AND  
ENVIRONMENT

27 FEB 1976

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
U.S. Department of the Interior  
Denver, Colorado 80202

Dear Mr. Andrus:

This is in response to your request of December 16, 1975, for the Department of Defense's comments on the Bureau of Land Management's draft environmental impact statement on the proposed development of oil shale resources by the Colony Development Operation in Colorado.

In general, the document is well prepared. We do note, however, that the narrative on possible land transfer and boundary locations in Chapters II, IV, and IX is very brief. Because any proposed actions of this nature may conflict with Navy operations, this reply should not be construed to mean approval of any such proposal. We should be pleased to discuss these issues when more data are available. In this regard, you should contact Captain G. G. Dowd, the Director, Naval Petroleum and Oil Shale Reserves, on (202)692-3966.

Thank you for the opportunity to review this important document.

Sincerely,

*George Marienthal*

George Marienthal  
Deputy Assistant Secretary of Defense  
(Environmental Quality)

cc: Captain Dowd





United States Department of the Interior  
BUREAU OF RECLAMATION  
WASHINGTON, D.C. 20240

IN REPLY  
REFER TO 150  
120, 2

MAR 3 1976

Mr. Dale R. Andrus  
State Director  
Bureau of Land Management  
Room 700, Colorado State Bank  
Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

We have reviewed the Draft Environmental Statement on Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado (DES 75/62). Our comments, which follow, are categorized by chapters within the statement.

Chapter II

1. Pages II-4 and II-6 show the anticipated electric load (100-MW maximum) and alternate corridors for 230-kV lines to serve the load from the Public Service Company of Colorado or adjoining systems. The transmission line corridor studies seem reasonable for current purposes. However, there have been newspaper accounts that the Public Service Company might build a coal-fueled powerplant in western Colorado to supply power for Colony and other associated developments. The final environmental statement should include a discussion of Public Service's planned sources for supplying the electric power.
2. Page II-7, paragraph one--Are these the only Bureau of Reclamation responsibilities in regard to this? What Upper Colorado Region, Bureau of Reclamation, responsibilities should be stated? If specific mention of Green Mountain Reservoir is made, then Ruedi Reservoir should be mentioned also.
3. Page II-53, paragraph two--The impact chapter should have an analysis of the possible long-term adverse chemical reactions which could take place in the dump pile due to subsequent fertilizers and mineral residue runoff. The same applies to sludge from sewer effluent on page II-71 and wastewater streams on page II-72.



A-6-67

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4. Page II-62, paragraph four--It is stated that 800 acres will eventually be rehabilitated; yet page II-66, paragraph three, states that after 10 years of production, well over 100 acres will have to be revegetated each year. What is to be done with the remaining area?
5. Page II-67, paragraph two--The total storage capacity of Green Mountain Reservoir is 154,645 acre-feet. Senate Document No. 80 indicates that 52,000 acre-feet of water stored therein shall be available as replacement in western Colorado of the water which would be usable there if not withheld or diverted by the Colorado-Big Thompson. Under the proposed contract water will be made available from the uncommitted portion of the remaining 102,645 acre-feet.
6. Page II-69--There is a lack of design and location information on the proposed pumping plant on the Colorado River. The only information is on page II-69 indicating the water pipeline is 18 miles long from river to site with a booster station and page II-78 indicating the water line has an 18- to 24-inch diameter. Details should be given as to design and location. Also, there is no information given for highway and railroad crossings.
7. Page II-69, paragraph five--Perhaps further study of available ground water should be made before surface water rights are decided upon. See also pages III-35 and 36.
8. Pages II-69 and 70--A sedimentation process will be done at ponds beside the water intake structure at Grand Valley. Where will these ponds be located? More details are needed.
9. Page II-70, paragraph one--The probable maximum thunderstorm is stated as 6.5 inches per hour, but the area of drainage basin of that storm is not stated.
10. Pages II-75 and 76--Perhaps some stipulations on the storage of fuels, LPG, ammonia, and sulfur byproducts on the site should be stated or applicable safety codes stated.
11. Pages II-79 to 81--The wood transmission line structures shown are type "H" frame instead of "K" frame as indicated.
12. Page II-83, paragraph one--"Sulfur will be discharged from trucks into a lined and covered sump and pumped to a storage tank." Where will this sump, tank, and pump be located? More details are needed.

13. Page II-89--The pipeline will parallel an existing El Paso natural gas pipeline for approximately 100 miles; not less than 15 feet close to it. Statements should be made concerning provisions against rupturing this pipeline by equipment during construction. Also, this should be mentioned in appendix 1 on oil spills in order to make provisions for prevention of rupture of gasoline while repairing the oil line. Note that both lines cross the Colorado River and marsh together (pages III-3 and III-6).

14. Page II-90, Oil pipeline, Colorado River crossing--The statement should acknowledge that a permit will have to be obtained from the Corps of Engineers and Environmental Protection Agency for work in the river under provisions of Activities in Navigable Waters.

15. Page II-108, last paragraph--Correct the spelling to "Savery-Pot Hook." Also, construction has been funded for fiscal year 1976 and the interim to October 1, 1976, which begins the new Federal fiscal year.

#### Chapter III

1. Page III-7--Depths to frostline should be mentioned in this section of the report, if they have been determined.

2. Page III-11, paragraph one--Reference for these data should be stated.

3. Page III-14, paragraph one--It is stated that two prominent intersecting vertical joint sets are present, which affect subsurface water movement. This jointing should be clarified with respect to the dump pile and possible leaching of chemicals; also, as to the two dams proposed to be built concerning their water-holding capabilities, particularly since one will contain contaminants. See also pages III-33 to 36, III-138, and IV-59 to 64.

4. Page III-16, paragraph two--Is this twice the known present domestic crude oil reserves? The facts are unclear.

5. Page III-16--This section on the pipeline route perhaps should contain a description of the ground water levels of the areas traversed. See also page III-154.

6. Page III-24, paragraph five--The statement "Historical earthquake records do not indicate that the proposed pipeline route is in a seismically active area along its course." is unclear. It should read: "Historical earthquake records indicate that the proposed pipeline route is not in a seismically active area anywhere along its course."

7. Page III-26, paragraph three--A reference should be given for this paragraph on water production.

8. Page III-31, paragraph two--The total capacity of Green Mountain Reservoir is 154,645 acre-feet instead of 152,000 acre-feet indicated in the statement.

9. Page III-32, paragraph three--The United States owns a decree dated August 1, 1935, covering the 154,645 acre-feet of storage in Green Mountain Reservoir.

Paragraph four--The last sentence of the paragraph should be changed to read: "Present studies indicate that there is a marketable water supply of approximately 48,000 acre-feet, part of which could be made available from Ruedi Reservoir for oil shale development."

Paragraph five--Beginning with "Gulf Mineral Resources Company . . ." the word "negotiating" should be changed to "requesting 30,000 acre-feet of water from Ruedi Reservoir . . ."

Paragraph six--This paragraph should be changed to read: "The Colorado River Water Conservation District owns a conditional decree with a priority date of July 29, 1957, covering 102,370 acre-feet of storage in Ruedi Reservoir."

10. Page III-160, paragraph three--The pipeline crosses approximately 2 miles of active landslide areas and creeping talus slopes. The statement should state provisions for special reinforcement or whatever is necessary to prevent damage to the pipeline.

11. Pages III-166 to 168--The pipeline crosses Highways 6 and 50, Interstate 70, and Western Railroad. There is a lack of information on this concerning provisions or permits for these crossings.

12. Page III-168, paragraph one--The pipeline route passes through the Valley City Reservoir site currently privately leased from the State of Utah for cultivation, but no special provisions for crossing this land are stated in the draft statement. This should be discussed in further detail.

13. Page III-184, paragraph one--It is stated that a new ski area with residential area and airfield, along with a recreation reservoir on the Colorado River, is being planned southwest of Rifle. Will the Grand Valley plans, proposed corridor, etc., affect any of these?

#### Chapter IV

1. Pages IV-52 to 71--These discussions should be expanded to discuss the oil shale project impacts on water supply and quality of the Colorado River as they relate to the Colorado River Basin Compacts and the Mexican Water Treaty.

2. Page IV-58--The impacts of withdrawing water from the Bureau's Green Mountain Reservoir should include a detailed discussion on water supply for other nonshale uses, water quality, and the aquatic ecosystem. A similar discussion should be included for impacts related to Ruedi Reservoir and the Fryingpan River.

3. Page IV-63--The report is unclear concerning arsenic concentration and subsequent dangers. Is it possible that the insoluble arsenic could become soluble? Is 12 pounds of soluble arsenic too risky, even before considering the insoluble arsenic? The disposal of arsenic at a rate of 530 bl/day in open dump pits, soluble or insoluble, is questionable. See also page II-35.

4. Page IV-73--This section should state if the reservoir is on a permeable or impermeable foundation. Also, it should state the ground water table in the dam area and the anticipated seepage.

5. Page IV-93, paragraph one--More should be said concerning possible overtopping of the two dams and pollution of the Colorado River and subsequent immediate cleanup.

6. Pages IV-97 and 98--It is questionable whether 6 inches of topsoil are sufficient for revegetation in the project area because of the properties of spent shale and its tendency to transmit salts upward due to capillarity. It is not clear if Colony is committed to covering processed shale with topsoil.

7. Page IV-100 refers to extending a 69-kv transmission line from Colony's existing facilities to the proposed plant site. Page IV-119 refers to a 60-kv line. The two references should be consistent. A discussion of the corridor for the 69-kv line should be included in chapter II. What relationships do the 230-kv and 69-kv lines have with aesthetics, land use patterns, and raptor electrocution?

8. Page IV-107, paragraph five states that "It is expected that if subsidence does eventually occur surface alteration would be a gradual, long-term process, probably without noticeable effect on the surface." But if this subsidence does occur, and does affect the surface, are there provisions for the company to correct subsequent surface drainage problems? This should be discussed further.

9. Page IV-119 discusses right-of-way 150 feet wide for the single circuit 230 kv lines. Could the width be reduced to 125 feet without undue hardship on the company?

#### Chapter IX

1. Page IX-24, paragraph three--The fourth sentence should be changed to read: "There are approximately 48,000 acre-feet of marketable water in Ruedi Reservoir, part of which could be made available for such uses."

The following comments concern the oil spill contingency and response plan appended to the draft environmental statement.

1. Page 8, paragraph two--Locating valves on either side of streams over 100 feet wide does not seem to be sufficient. Additional valving should be supplied on both sides of smaller tributaries and should be automatic closing pressure valves, not manual.

2. Page 8, paragraph three--The potential for a 12,000 barrel afterflow would seem to be extremely high.

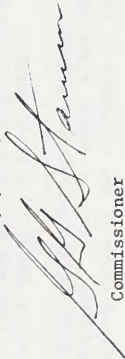
3. Pages 33 to 35--There is no indication of notification to the Bureau of Reclamation in any case. This should be modified to include Bureau notification in case of any spill which reaches water or any spill which is expected to reach water, as it would appear that in many instances, the Bureau is involved in the water's ultimate delivery or impoundment.

4. Page 70--Cleanup should include washing and scrubbing of streambed materials in dry streams in all cases.

5. Page D-22--Figure 14 indicates a large amount of oil travel and resultant pollution before recovery.

6. Page D-26--More detail on the possibility of oil crossing Bureau of Reclamation right-of-way and explicit methods of oil spill control in this area is needed.
7. Page D-30--Design Features--Isolating valves should be required at all stream crossings to reduce the afterflow from the 12,000 barrel amount.

Sincerely yours,



Commissioner



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20201

MAR 10 1976

Mr. Dale R. Andrus

State Director  
Bureau of Land Management  
Department of the Interior  
Colorado State Office  
Room 700, Colorado State Bank Bldg.  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

This is an addendum to our comments of February 25, 1976 on the draft Environmental Impact Statement concerning the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado.

1. Water Quality. Given that it is likely that erosion and decreased water quality will eventually occur at the processed shale disposal site (Chapter VI), we recommend that:

- (a) more permanent alternatives be considered that would reduce water pollution, e.g., the use of a rock riprap face on the shale disposal site;
- (b) coke and especially heavy metal and arsenic catalysts used in the pyrolysis process be disposed of separately, with special attention directed to long-term safety and the possibility of present/future recycling and metals recovery. Since some heavy metals and arsenic have been known to accumulate in plants and animals at levels that may present human health hazards, it is important that these materials be prevented from entering Parachute Creek and the Colorado River. As these water flows are used for potable water, livestock and agricultural water, and sports fishing, it is essential to avoid decreases in water quality associated with oil shale utilization on a permanent basis extending far beyond the expected life of the processing plant.

#-34

Mr. Dale R. Andrus - Page 2

2. The draft document does not address the cumulative effects large scale utilization of oil shale deposits will have on air and water quality, wildlife, and agriculture in the Colorado River Basin.
3. Energy Costs. While the subject document addresses the various sources of energy required for oil shale utilization and the anticipated output of the facility, it would be helpful if this information were summarized in an energy input-units output section which would reveal the energy efficiency of the operation. Environmental impacts should be compared with the net energy produced rather than gross energy production.
4. Environmental Monitoring. It is recommended that air, water, and biological impact of the Colony site, should the proposed action be implemented, be monitored to quantify the environmental impacts not presently quantifiable in Chapter VI. Such studies would aid in the industry's plan for mitigating environmental impacts resulting from the proposed action. More importantly, this would provide information about pollutants and their environmental effects associated with a new, developing industry. This information could be used to assist the oil shale industry reduce the environmental impacts associated with the extraction of valuable energy resources.
5. Air Pollution. As previously mentioned in our comments of February 25, 1976, "Pyrolysis of the raw ore shale into hydrocarbon vapors and liquids could lead to health conditions hazardous to human health." It should be noted that some hydrocarbons, e.g., polycyclic aromatics, may be carcinogenic.

Thank you for the opportunity to review the document.

Sincerely,

*Charles Custard*

Charles Custard  
Director  
Office of Environmental Affairs

DEPT OF INTERIOR  
BUREAU OF LAND MANAGEMENT  
COLD SPRING CREEK, DENVER

UNITED STATES DEPARTMENT OF AGRICULTURE  
FOREST SERVICE

Rocky Mountain Region  
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173 MAR 15 AM 10:00

February 20, 1976

4-35



Dale R. Andrus, State Director  
United States Department of the Interior  
Bureau of Land Management  
Room 700, Colorado State Bank Building  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

Our comments on the Proposed Development of Oil Shale Resources Draft Environmental Statement are as follows:

1. Discussion of Federal, State, and local authorities appear in a number of places throughout the Draft Statement.

Some of the pertinent references are II-5 through II-9, III-60 through III-63, and V-24. As there have been some media reports that State and Federal agencies have their differences, I believe the Environmental Statement should address this concern and advise the reader of (1) the Federal position as to whether or not State and local requirements can affect the Federal agencies' ability to carry out Federal programs and, if so, to what extent, and (2) the State and local view with respect to the same question.

2. The D.E.S. on page IV-168 points out that a population increase of 4,100 will result in considerable impact on the recreation resources within the area. As he was not listed on page iv for comments on the D.E.S., I recommend that the Director, Colorado Division of Parks and Outdoor Recreation, be contacted concerning potential favorable and adverse effects on the recreation resources.

The effects of increased population generated by the development upon the developed and dispersed recreation on National Forest lands do not appear to be adequately covered. The emphasis in the report, page VI-15 is facility oriented and does not address the dispersed forms of recreation. Page V-24 also suggests that increased funding will mitigate the impacts on the recreation resource from the increased population. The mitigation should be expanded to cover other forms of mitigation possible for the impacts and effects on developed recreation as well as mitigation of impacts on dispersed recreation.

3. Pages VI-7 and VIII-1 mentioned that alumina and halides will be lost in the waste pile. It seems that both could be recovered from the waste pile at some future date when favorable economics will make "ore" of the wastes.

Reference page VI-5. Productivity may be lowered, but it will not be eliminated on waste areas if top soil is stock piled and placed on these areas to aid revegetation.

*Craig W. Rupp*  
CRAIG W. RUPP  
Deputy Regional Forester, Resources



FEDERAL ENERGY ADMINISTRATION  
WASHINGTON, D.C. 20461

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#-36

MAF 11/17/76

OFFICE OF THE ASSISTANT ADMINISTRATOR

FEA 75-628

Mr. Dale R. Andrus, State Director  
Bureau of Land Management  
Department of the Interior  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

This is in response to your request for our review and comment on the draft environmental impact statement (EIS) on the Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado.

Our comments are presented below according to subject matter.

Resource Recovery

This proposal represents a pioneer private venture in the development of the oil shale industry. We are, therefore, encouraged to see the mining plan estimates that only 40 percent of the shale will be left as pillar supports. This is a significant improvement in resource recovery over the traditional values in coal mining room-and-pillar methods. However, it should be noted that International Nickel uses a process in Canada where they back fill in their mines with a spent ore/cement slurry. This process produces much more available ore, since pillars are not needed for support. The potential uses of this process should be explored in the EIS.

Spent Shale Disposal

Colony's solid waste plan seems to be a relatively sound one with respect to a proper refuse site and bank stability. However, there are several facts which have been omitted from the statement that would provide useful information and should be incorporated into the final EIS.

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It is not stated whether a maximum weathering period for oxidation and dissipation of the generated heat is planned before the spent shale is placed permanently. A study being conducted by Denver Research Institute is currently investigating auto-oxidation in spent shale disposal piles. Auto-oxidation has, in the past, occurred in Scottish spent shale disposal piles containing an average carbon content of only 3 percent. The carbon content of the spent shale from the Colony operation may not be high enough to lead to spontaneous combustion, but may form local hot spots and slow self-oxidation.

The draft EIS does not state whether or not Colony plans to place a clay liner beneath the planned refuse disposal area to prevent infiltration of surface waters into the surrounding environment. It also should include a statement as to whether a clay liner will be placed over the top of the spent shale disposal pile, after the desired height is attained, to minimize infiltration.

The draft EIS does not adequately discuss how the spent shale disposal dam will be maintained after the oil shale operations cease. In light of the fact, many potentially harmful contaminants and trace elements could enter the environment if the dam leaked or broke, a more thorough discussion on the maintenance of the dam should be presented.

Finally, an estimate of the number of acres which the spent shale will cover in the Davis Gulch should be given.

We hope that our comments on the EIS are useful to you. This program is a pioneer venture and will be a valuable learning experience toward the development of a U.S. oil shale industry.

Sincerely,

*R. W. Sant*

Roger W. Sant  
Assistant Administrator  
Energy Conservation and Environment

Natural Resources Defense Council, Inc.

917 15TH STREET, N.W.  
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Executive Director

A-6-74

The Honorable Thomas S. Kleppe  
Secretary of the Interior  
Department of the Interior  
C Street & 18th Street, N.W.  
Washington, D.C. 20240

Dear Mr. Kleppe:

On December 12, 1975, the Department released a draft environmental impact statement titled Proposed Development of Oil Shale Resources by Colony Development Operation. This statement does not concern an active proposal. As quoted in the recent issue of Shale Country, Hollis Dole, general manager of Colony's operations, stated that as of 1975:

"Colony is still in a state of suspension. . . .

" . . . .

"As for 1976, everything depends on the government. If a federal synthetic-fuels policy is set forth, and if the Colony partners choose to reactivate the project, how fast we get going depends on the time of the year. It would take 6-9 months under the most optimal conditions."

As a result, the proposed federal action concerns activities which depend on private actions which may never be undertaken. Moreover, if and when the proposed private actions are renewed, they may differ significantly in scope and content from those on which the draft statement is based.

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January 27, 1976

Hon. Thomas S. Kleppe  
January 27, 1976  
Page 2

In light of these uncertainties, the draft statement does not address a realistic proposal. And the analysis in the statement of such matters as the environmental impact of the proposed action, alternatives to the proposed action, the environmental impacts of these alternatives, and the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity is necessarily hypothetical.

It is a waste of valuable and scarce Departmental resources to complete preparation of a final environmental statement on a hypothetical action. The Department should devote its scarce resources to active proposals and cease further work on the draft Colony environmental statement. Only when and if Colony presents a similar or related proposal to the Department should the Department undertake preparation and completion of an environmental impact statement.

On January 23, 1976, representatives of ten environmental organizations wrote you asking that "no decision or federal action take place pursuant to this EIS, until and unless there is an active proposal with a proposed time schedule." I join them in this request.

Sincerely yours,

*Edward L. Strohben, Jr.*  
Edward L. Strohben, Jr.

els:lcs

cc: Curtis Berklund  
H. Gregory Austin  
Russell E. Peterson  
Gary L. Widman



# United States Department of the Interior

GEOLOGICAL SURVEY  
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

#-38

38

2

MAR 30 1976

## Memorandum

To: Director, Bureau of Land Management

Through: Assistant Secretary--Energy and Minerals *Richard A. Rusk*

From: Director, Geological Survey  
MAR 30 1976

Subject: Supplemental review of draft environmental statement for development of oil shale resources by the Colony Development Operation, Colorado and Utah

We are providing the following comments to supplement those in our memorandum of February 11.

Page II-2, Figure II-1: Will there be a drainage diversion dam located above the processed shale disposal pile in Davis Gulch?

Page II-5, Paragraph 1: Will any source of on-site generation be used to supply construction or emergency power?

Page II-27, Paragraph 1: It would be advantageous to mention that the TOSCO II retort is capable of handling fine shale material.

Page II-29, Table II-7: How do the indicated concentrations compare with permissible discharge limits?

Page II-33, Paragraph 2: Leaching tests should be done on the various hydrogen unit catalysts before they are disposed of in the processed shale pile.

Page II-34, Paragraph 1: It would be helpful to include a statement on why nitrogen and sulfur must be removed from the product oil. Sulfur removal is important because of air quality standards. Nitrogen removal is of prime importance because nitrogen is a very potent poison to refining catalysts.

Page II-35, Last paragraph: As previously mentioned, it seems desirable to run leaching tests before arsenic is disposed of in the processed shale pile.

Page II-38: It is assumed that the abbreviation "acf" stands for acre-feet. It might be well to explain this abbreviation and others where they are used for the first time.

Page II-36, Paragraph 4: What is the nature of the contaminants generated during catalyst regeneration?

Page II-37: A statement should be included as to why naphtha is hydrogenated separately from the gas oil. One reason might be that naphtha takes less severe hydrogenation to remove sulfur and nitrogen than does the gas oil.

Page II-39, Paragraph 1: Same comment as given for the fourth paragraph on page II-36.

Page II-41, Paragraph 2: What is the stability of the aluminum catalyst that is disposed of with the processed shale?

Page II-43, Paragraph 3: It is assumed that any coke disposed of with the processed shale will not be reclaimed even if a market can be found for this material.

Page II-48, Table II-13: Tables of this nature are very beneficial to the overall understanding of the proposed project.

Page II-53, Paragraph 3: On what grounds can it be assumed that the quantities of organic material to be mixed in with the processed shale will not, in fact, result in spontaneous combustion or generation of toxic leachate?

Page II-60, Figure II-27: The utility of this figure would be materially enhanced if an approximate outline of the maximum extent of the processed shale disposal pile were shown.

Page II-63, Paragraph 2: What is meant by the phrase, "lateral shale fractured surface interface?"

Page II-65, Paragraph 1: How much water will have to be applied to the processed shale pile in order to leach the salts down to a satisfactory level?

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Page II-66, Paragraph 6: An indication of some of the possible stabilization techniques that could be used if revegetation is unsuccessful would be helpful.

Page II-69, Paragraph 4: It appears that the source of water being talked about is from ground-water discharge. This fact should be clarified.

Page II-69, Paragraph 5: From what aquifer will the wells discussed draw water? What would be a reasonable estimate of the annual pumping rate?

Page II-70, Paragraph 1: What is the stability of the water treatment wastes that will be disposed of in the processed shale pile?

Page II-71, Paragraph 1: Will the packaged sewage treatment plant afford primary, secondary or tertiary treatment?

Page II-71, Paragraph 3: Has any consideration been given to use of dried sewage sludge as a soil amendment to facilitate revegetation of processed shale disposal areas?

Page II-74, Paragraph 1: Would condensation and precipitation of salty droplets in the vapor plume have any adverse effect on the vegetation within the down plume area?

Page II-75, Paragraph 1: Has any estimate been made of the probable seepage to the ground-water system of water stored behind the Davis Gulch Dam?

Page II-75, Paragraph 3: Over the 20-year expected life of the project, what percent of the storage capacity behind the Middle Fork and Davis Gulch Dams will be filled with sediments? If, in fact, the dams are not sold and removal operations are begun, what will be the ultimate fate of the sediment stored behind Middle Fork and Davis Gulch Dams?

Page II-76, Paragraph 1: What type and volume of emergency containment will be provided in the tank storage area?

Page II-83, Paragraph 2: What type and volume of emergency containment will be provided at the Grand Valley Product Storage area?

Page II-83, Paragraph 5: Has any consideration been given for disposal of sewage and other polluted wastes from the Grand Valley facility by putting them into the existing Grand Valley Municipal Sewage Treatment system?

Page II-85, Paragraph 4: How do the oil shale and other economic resources beneath the offered lands compare with those beneath the requested lands?

Page II-87, Table II-26: What is the basis for the estimated tonnage and barrels of shale oil stated in this table? Do they represent total in-place resource, recoverable resource, Mahogany zone, or just the mining unit?

Page II-88, Figure II-37: To facilitate cross reference of this figure with the table on the preceding page, it would be helpful if each of the selected tracts were numbered to correspond with table II-26.

Page II-90, Paragraph 5: What type of containment will be provided at the Lisbon Valley Station?

Page II-99, Paragraph 3: In addition to the existing Federal prototype oil shale leases, there is a possibility that additional leases for in-situ development may be granted in the near future.

Page II-103, Figure II-43: The Anvil Points operation is not shown on this map.

Page II-106, Figure II-44: The two Federal Oil Shale tracts should be appropriately labeled.

Page II-108, Paragraph 7: No mention is made of the proposed Moon Lake coal mine and power plant near Rangely.

Page III-7, Paragraph 4: Some mention should be made of the evaporation rate in the Roan Plateau area.

Page III-27, Figure III-18: The value of this figure would be enhanced if the general dip directions were shown.

Page III-29, Paragraphs 1 and 2: What are the sources of the flow figures for the Colorado River cited in these paragraphs? Furthermore, what is meant by the term "virgin flow," and is the amount covered by this term equal to the 15 million acre-feet reported in the first paragraph? The value of 15 million acre-feet is also in question. Available information suggests that this value is more like 13 million acre-feet.

Page III-31, Paragraph 2: Reservoir capacity has no direct relationship to yield. What is the annual yield of the Green Mountain Reservoir?

Page III-32: Same comment applies to all paragraphs on this page which make reference to reservoir capacity.

Page III-32, Paragraph 3: There is a growing body of data that indicate abundant ground water in Utah and Wyoming oil shale areas..

Page III-32, Paragraph 4: Available data suggests that the Uinta Formation is dry over much of the southern portion of the Piceance Basin.

Page III-35, Paragraph 2: There is an increasing wealth of information which suggests that the ground water in the Green River Formation is recharged over the entire basin area by downward percolation of water through the overlying Uinta Formation. Recharge along the basin margin may, in fact, be relatively insignificant in terms of total ground-water storage in the Green River Formation.

Page III-35, Paragraph 4: Discussion should include ground-water yields from zones other than the Mahogany zone of the Parachute Creek Member.

Page III-36, Paragraphs 2, 3, and 4: The discussion in these paragraphs regarding average annual salinity concentration of the Colorado River is unclear. The discussion does not include salinity trends.

Page III-36, Paragraph 5: Headwaters of the Colorado River need to be defined as to geographic area.

Page III-37, Paragraph 1: Does the term, "present modified," refer to "virgin" flow or actual flow? Furthermore, in table III-5, do the flow figures listed represent mean annual flow?

Page III-38, Paragraph 1: Available information suggests that some water in the upper Green River Formation near the basin center is much lower in total dissolved solids than 25,000 mg/l suggested by this paragraph.

Page III-130, Paragraph 1: The Mahogany marker is included within the U.S. Geological Survey's classification of the Mahogany zone and not above it.

Page III-130, Paragraph 5 and Page III-131, Table III-30: The figure cited for estimated resource in barrels does not agree. The paragraph states that there would be approximately 580 million barrels of oil whereas the table cites a figure of only 515 million barrels. Furthermore, does this figure represent in-place or recoverable shale oil?

Page III-130, Last paragraph: The statement to the effect that no reliable resource figures for oil shale below, above, and including the remaining 75 feet of the Mahogany zone are available suggests that Colony may not have completed a comprehensive resource core hole evaluation.

Page III-134, Paragraph 1: The clarity of this paragraph would be enhanced by inclusion of a statement of the percent of total drainage area that lies above the Colony property.

Page III-134, Paragraph 2: The statement, "Parachute Creek contributes approximately one percent of the total flow of the Colorado River at Grand Valley," is misleading because a value this small is within measurement error and, therefore, of questionable value.

Page III-137, Paragraph 1: The statement that "Analysis of water samples to date have not shown any lead or mercury" raises serious question regarding the sampling and analytical techniques used. Both lead and mercury are present in the Green River Formation and occur in measurable quantities in main tributaries to Piceance Creek and Yellow Creek.

Page III-137, Table III-32: Are the values indicated in this table mean, maximum, or minimum runoff averages, and do they reflect daily, monthly, or weekly periods?

Page III-138, Paragraph 2: References to "the impervious Mahogany Ledge" is misleading. The term "impervious" implies zero permeability which, in fact, is not the case anywhere in the Piceance Basin.

Page III-138, Paragraph 3: The last sentence of this paragraph is misleading. Do the authors of the statement mean that the talus deposits are the only source of water for the springs or are there other significant sources which should be mentioned?

Page III-139, Paragraph 2: The second sentence in this paragraph states: "Parachute Creek is dependent on springs for continued flow throughout the year." This statement completely overlooks the significant role that seepage from the alluvium along Piceance Creek plays in maintaining streamflow throughout the drier parts of the year.

Page III-160, Paragraph 1: The statement in the second full sentence, "Soils under the sagebrush...are well developed and relatively stable," should be expanded to provide a definition of what is meant by the phrase "relatively stable."

Page IV-2, Table IV-1: The treatment of environmental effects, causes, and nature of impacts in this table is very good.

Page IV-54, Paragraphs 2 and 4: What method is used to compute the maximum probable storm for purposes of designing the size of the reservoir behind the mine bench?

Page IV-56, Paragraph 3: Are there not more recent records for computing streamflow than those referenced for the period 1901 through 1933?

Page IV-59, Paragraph 4: The sentence, "the artesian springs in Davis Gulch and Middle Fork Valley above the canyon rim are the result of ground water which begins in the impermeable shale beds of the Parachute Creek Member" is somewhat ambiguous. Use of the term "impermeable" is seriously questioned. This term implies that the beds cannot conduct water and, therefore, would not be the source of any surface seepage or springs. Furthermore, the statement in the last sentence of this paragraph implies that downward percolation of ground water ceases at the lower Garden Gulch Member. This position is extremely questionable. In reality, ground water probably continues downward movement into the Wasatch beds.

Page IV-59, Paragraph 5: The sentence, "Dewatering will quickly reduce hydrostatic head in the regional fracture," is unclear. What is meant by the term "regional fracture?"

Page IV-60, Paragraph 1: The phrase, "will tend to reflect the surface excavation pattern," is unclear. It is assumed that the final part on this phrase should read, "reflect the subsurface excavation pattern." The phrase, "causing erosion capability of streams," in the last sentence of this paragraph probably should be rewritten to read, "changing the erosion capability of streams." It should also be noted that in certain reaches deposition of material would occur.

Page IV-61, Paragraph 3: The first sentence of this paragraph implies that total dissolved solid concentrations are related to erosion and turbidity. This is not the case.

Page IV-63, Table IV-13: This table suggests out of the several elements listed only arsenic is soluble in water. This, of course, is not the case. What is meant by the term "standard" in the column for concentration opposite indium?

Page IV-65, Paragraph 2: The phrase, "the conversion of shale to the fine dust," seems to imply that the TOSCO process would reduce all feed shale to fine particulate matter. This conclusion is questionable.

Page IV-68, Paragraph 3: Is the quantity of arsenic produced in terms of tons per day or per year?

Page IV-70 and 71: The observation made in this paragraph regarding ground-water contamination needs further explanation.

Page IV-86, All paragraphs: Does the discussion regarding probable flood flow as a result of dam failure include the large quantity of sediment that would be picked up by such a flow?

*Henry W. Culler*  
Acting Director

Calvin L. Rampton  
Governor



'76 MAR 10:00

910

#-39  
Burton L. Carlson  
State Planning  
Coordinator

STATE OF UTAH

Office of the  
STATE PLANNING COORDINATOR

118 State Capitol  
Salt Lake City, Utah 84114  
(801) 533-5245

March 25, 1976

Dale S. Andrus  
State Director  
Colorado State Office  
Bureau of Land Management  
Room 700, Colorado State Bank Bldg.  
1600 Broadway  
Denver, Colorado 80202

Dear Mr. Andrus:

The Utah State Environmental Coordinating Committee has reviewed the Draft Environmental Impact Statement on Proposed Development of Oil Shale Resources by the Colony Development Operation in Colorado. (DES-75-62)

The solo comment by the Committee is a stated preference for the Moab Alternate as it appears to be environmentally less damaging for Utah should the project be implemented.

Thank you for an opportunity to comment.

Sincerely,

Burton L. Carlson  
State Planning Coordinator

BLC/jn

cc: Paul Howard, Utah State BLM  
ECC Members



UNITED STATES

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
WASHINGTON, D.C. 20545

176 APR 5 AM 10:10

MAR 30 1976

#-40

State Director  
Bureau of Land Management  
U.S. Department of the Interior  
Colorado State Bank Building  
Room 700  
1600 Broadway  
Denver, Colorado 80202

Dear Sir:

This is in response to your transmittal inviting the Energy Research and Development Administration (ERDA) to review and comment on the Department of the Interior's Draft Environmental Statement, DES 75-62, prepared by the Bureau of Land Management to support the administrative action for the proposed development of oil shale resources by the Colony Development Operation in Colorado. We have reviewed the document and have determined that the proposed action will pose no conflict with any known or planned fossil energy programs, within ERDA.

Generally, it is felt that the document did present adequate material to inform one as to the environmental problems that may likely be encountered in constructing a retorting facility close to an oil shale mine. The physical and the biological problems have also been well presented; however, we would like to provide the Bureau with some comments which we think you may want to address in the final statement.

It is our opinion that the discussion relative to reclamation needs further elaboration. Since the document states that there is sufficient topsoil available to cover only about one-third of the spent shale, and since all of the alternative possibilities except return to the mine also require topsoil, it is not clear how the revegetation program will proceed. If topsoil is not required, we would like to see research data to support that fact.

The discussion presented on predictions relative to air quality appears to be reasonable given the state-of-the-art and we think it was prudent to point out the uncertainties of the calculations. However, one point which was probably not considered, because of no existing Federal standards, is the possibility of acid rain in and around the area as well as

DEPT OF INTERIOR  
E. B. LAND MANAGEMENT  
COLORADO STATE BANK BUILDING

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at distances of about one day's travel in the air. The acid rain transport possibility could have an adverse impact on water quality and should be considered in the final statement.

Another concern which we have is the unanswered question as to the level of arsenic in the run-off water. It appears from a technical standpoint that this method of disposing waste arsenic is questionable. It is stated (pages II-85, IV-65, IV-68) that solid arsenic is to be deposited on the spent shale pile at the rate of 531 pounds per day. We realize that only a part of this arsenic is in soluble form, but we would like to see some estimate of the level in the run-off water and what potential impact this would have.

The accompanying appendices are felt to be a well written and easily understood plan for dealing with any size oil spill on land which has the potential for polluting small streams that feed into larger rivers. However, the proposed pipeline right-of-way will be on national resource lands for over half of its total length of 194 miles. The pipeline design provides for a future rate of 100,000 B/D and a maximum operating pressure limited to 885 PSIG. The statement contains considerable data on line drainage volumes for full line rupture but does not recognize the possibility of drainage due to relatively small pipeline leaks.

Various monitoring features are utilized as preventive means for reducing leak frequency such as pressure monitoring and associated alarms and visual inspection. It is considered that additional information relative to pipeline automatic monitoring and control (page 25 and 26 of appendix I) would be helpful in determining the level of leak detection capabilities. For example, the pressure sensitivity of the pipeline pressure deviation alarm would be of interest. Reductions in pipeline pressure could possibly be related to projected pipeline leakage rates. Data concerning the level of sensitivity and accuracy of the flow balance deviation alarm could be added to appendix I such that it could reflect the level of leak detection capability of the automatic monitoring and control system.

Since this pipeline will cross the Colorado River and natural resource lands, the automatic detection capability of relatively small pipeline leaks would be desirable from an oil spill standpoint.

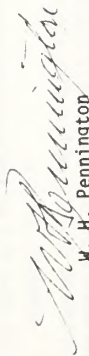
We hope these comments and the ERDA Staff Comments which are enclosed will be helpful in the preparation of the final statement.

A-6-80



Thank you for the opportunity to review and provide these comments.

Sincerely,

  
M. H. Pennington  
Officer  
Division of Biomedical and  
Environmental Research

Enclosure:  
ERDA Staff Comments

cc w/enclosure:  
CEQ (5)

ERDA STAFF COMMENTS

ON THE

U.S. DEPARTMENT OF THE INTERIOR  
DRAFT, ENVIRONMENTAL STATEMENT  
DES 75-62

General

1. Some discussion would be helpful with regard to the unmined oil shale. To what extent would its recovery be impaired if spent shale is returned to the mine?
2. Why will only the top of the mahogany zone be extracted? Who has rights to the remaining oil shale? Some discussion is needed regarding the portion of the resource to be left.

Specific

1. A brief paragraph on page II-7 alludes to a "spill prevention countermeasures plan" for storage facilities, which must be filed with the Environmental Protection Agency (EPA). Some additional discussion is suggested regarding the regulatory basis for the plan and what it covers. Such information may be obtained from EPA Regulation Title 40 Code of Federal Regulations, Part 112, Oil Pollution Prevention, which establishes requirements for the preparation and implementation of Spill Prevention Control and Countermeasure Plans (SPCC).
2. In note (b) at the bottom of table IV-4 on page IV-29, the word "health" should be substituted for "welfare".
3. The title of table IV-9, page IV-42, can be interpreted as applying to emissions rather than ambient levels of pollutants. The word "emission" in the title should be changed to "pollutant".
4. The terminology "decibels per hour" (dBA) in the last paragraph of page IV-172 should be "decibels".
5. We suggest that references such as number 2 in chapter IV not be used. Documented references are preferred.
6. The implication, in the first paragraph on page V-2, that the proposed facility is required by law to meet Federal regulations covering ambient levels of nitrogen oxides, carbon monoxide, and hydrocarbons is misleading. Ambient air quality levels which the established by EPA set the ambient air quality levels which the states must attain through the promulgation and enforcement of appropriate emission standards. It is these emission standards that the proposed facility must meet.

7. The penultimate paragraph on page V-5 is not clear in explaining the distinction between the oil spill contingency plan for the pipeline and the spill prevention plan for the plant-mine and terminal storage facilities. The spill plan for the pipeline, as provided for in Appendix 1 of the draft statement, relates to regulatory actions which deal with response procedures which are set in motion after a spill has occurred (e.g., 40 CFR 1510, the National Oil and Hazardous Substances Pollution Contingency Plan). It also applies to the plant-mine and terminal storage facilities. The spill prevention plan which provides for facilities for preventing the occurrence of an oil spill (dikes, containment, diversion ponds, emergency valves, etc.) is required by 40 CFR 112, Oil Pollution Prevention, and applies to the plant-mine and storage facilities but not the pipeline.
8. Mitigation of sociological impacts by Colony are not considered in chapter V nor are they considered in chapter IX as an alternative to "unavoidable" impacts. The possibility of Colony presenting a financial plan which provides economic assistance for "front-end" capital funding is a viable alternative and should be discussed. In addition, a plan should be presented for cooperating with communities in providing for required services and societal demands.
9. Chapter IX is essentially a collection of information on various alternatives. There is no analysis and no presentation or discussion of the rationale for selecting the proposed actions from among the various alternatives. For example, table IX-3 contains energy requirements for various modes of transportation. Was this the basis for the selection? If so, why present the extensive set of data relative to the pipeline? What is needed is a concise set of statements giving the primary reasons for selecting the set of proposed actions rather than the other options.
10. The definition of dBA on page G-3 of the Glossary should be "decibels" instead of "decibels per hour".



C.J. KUIPER  
State Engineer

# - 41

Colorado Division of Planning  
February 13, 1976

Page 2

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## DIVISION OF WATER RESOURCES

Department of Natural Resources  
300 Columbine Building  
1845 Sherman Street  
Denver, Colorado 80203  
Administration (303) 892-3581  
Ground Water (303) 892-3587

February 13, 1976

Colorado Division of Planning  
615 Columbine Building  
1845 Sherman Street  
Denver, Colorado 80203

Re: Colony Development Operation  
Draft Environmental Impact  
Statement

Gentlemen:

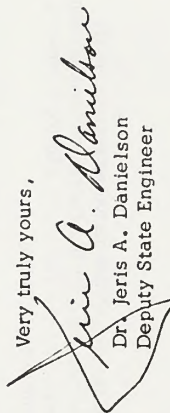
This is to acknowledge receipt of the above referenced draft environmental impact statement prepared by the Bureau of Land Management. As requested, I have reviewed the statement and the following comments are presented for your consideration:

1. On page II-69 as well as in other portions of the statement, it is stated that all runoff from the Dow West property will be captured and used. However, there is no apparent recognition that this must be done in accordance with Colorado water law. The capture and storage of water native to the Parachute Creek watershed will require that both reservoirs have adjudicated water storage rights. If water is stored during times when there is a demand for water by a senior downstream water right, then a plan of augmentation or plan of exchange must be provided which provides replacement water to these water rights. Also, this plan must be approved by the Division Water Court. Furthermore, the plans and specifications for the construction of both dams must be approved by the State Engineer prior to construction.
2. On page III-33, a discussion of the basic requirements for obtaining a water right is presented; however, no mention is made that in order to establish a priority for the use of water, an appropriator must have the water right adjudicated by the Division Water Court. If it is not adjudicated, it will be administered as a water right junior to any other adjudicated water right.
3. The discussion in the Surface Hydrology subsection, page III-133, of the Mine and Plant Site Section does not address water supply, present depletions, future depletions, and water rights for the Parachute Creek watershed as was similarly discussed for the Colorado River in the Regional Setting Section. Without the knowledge of these factors, a total evaluation of the impact of the Colony Operation cannot be made, and obviously, has not been made.
4. It is stated that the impoundment and use of water will reduce the average annual runoff of Parachute Creek near Grand Valley by 2.5 percent. It is also stated that additional flow reductions may occur from drying up of springs and from pumping of wells (page IV-55). Again, no evaluation is made of the impact of this flow reduction on other vested water rights.
5. As a result of the mine dewatering operations using wells, the depletion to the Parachute Creek average flow is estimated to be 420 acre feet per year (page IV-60). Again, the impact of this depletion upon other water users is not evaluated or considered. I might add that well permits would not be issued to Colony if it is found that injury to vested water rights could occur.
6. In Chapter V, Mitigating Measures, of the Water Resources Section, all discussion is directed towards water quality. As I have stated above, the Colony Operation is subject to Colorado water law and any potential injury to vested water rights must be mitigated by providing a plan of augmentation approved by the Division Water Court. Thus, Chapter V should be revised to include the mitigating measures that Colony will undertake.

7. In Chapter VI, Adverse Effects Which Cannot Be Avoided, it is stated that the reduction in Parachute Creek's average annual flow cannot be avoided. Obviously, this adverse effect can be avoided by providing a plan of augmentation utilizing releases of water from the Colorado River pipeline into Parachute Creek. These releases would be required only during times that senior vested water rights are being injured.

From the above, it can be seen that the Draft Environmental Impact Statement is not acceptable and should be revised to include discussion on each of the above. I would be most happy to review future drafts of the Environmental Impact Statement if requested by your office.

Very truly yours,

  
Dr. Jeris A. Danielson  
Deputy State Engineer

JAD/HDS:mvg

cc: L. Enewold  
R. Stallman  
P. Capuette

STATE OF COLORADO  
Richard D. Lamm, Governor  
DEPARTMENT OF NATURAL RESOURCES

**DIVISION OF WILDLIFE**

Jack R. Grieb, Director  
6060 Broadway  
Denver, Colorado 80216 (825-1192)

Mr. Richard Brown, Principal Planner  
Colorado Division of Planning  
615 Columbine Building  
1845 Sherman Street  
Denver, CO 80203

Dear Mr. Brown:

Following are comments regarding the draft environmental statement (DES-75-62) for the proposed development of oil shale resources by the Colony Development Operation in Colorado:

Page II-62, 4th Paragraph. Full 800 acres of processed shale pile must be planned for 6- inch topsoil application, - not just 200 acres. Revegetation of permanent and stable plant cover of the processed shale without topsoil is highly questionable, if not impossible.

Page II-65, 2nd Paragraph. Details of irrigation are missing. If continuous irrigation of entire area under reseeding is intended, rates of application, lengths of application (including time extensions planned for after 20-year plant life), and water source adequacies are some items not given attention here and, in part, only very meager in the last paragraph, bottom of Page II-66 following.

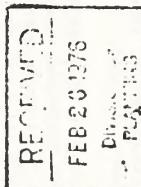
Page II-72, Lines 5, 6, and 19, and Page II-73 (Figure II-32, Water System Flow Diagram). Revegetation sources and volume estimates help clarify planning deficiencies mentioned above for Page II-65 but still do not provide for treatment of processed shale embankment after 20-year life of the plant. Again, referring to the last (bottom) paragraph on Page II-66 relative to the foregoing subject, Colony says it will not predict what will be done with the embankment after the 20-year expected life of the operation. That and the other statements in this paragraph show severe lack of responsibility in relation to future public safety downstream.

Page IV-76 thru 86. Hypothetical instantaneous surge flow analyses admittedly depict highly unlikely happenings in the future. But, if such flood possibilities exist, as they surely do, the lack of consideration shown for post-operations surveillance (as indicated in the preceding two sections) makes one wonder about the humanistic aspects of the Colony program.



February 24, 1976

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Mr. Richard Brown  
February 24, 1976  
Page 2

Page IV-136, 3rd Paragraph and Page IV-143 RAPTORIAL BIRDS. No mention is made of the possibility that peregrine falcons nest in Parachute Creek canyon and what additional human disturbance might mean to their welfare. Direct destruction of cliff habitats might be minimal, but more is certainly involved than that activity.

Page IV-137, 3rd Paragraph. Possibilities of deer-auto collisions on the access road and/or elsewhere on service corridor roads can be minimized through proper application of animal control techniques already available from Division of Wildlife research. Cooperation between Colony and the Division on highway deer control is urged, if not planned for definitely now (see Page IV-151, 1st and 2nd Paragraphs for additional base information).

Sincerely yours,

*Jack R. Grieb*  
Jack R. Grieb  
Director

JRG:cs

cc: R. Elliott  
R. Evans  
W. Sandfort

RICHARD D. LAMM  
GOVERNOR



#-43

JOHN W. ROLD  
Director

COLORADO GEOLOGICAL SURVEY  
DEPARTMENT OF NATURAL RESOURCES

254 COLUMBINE BUILDING - 1845 SHERMAN STREET  
DENVER, COLORADO 80203 PHONE 892-2611

January 28, 1976

Richard L. Brown  
Colorado Division of Planning  
1845 Sherman Street  
Denver, Colorado 80203

Dear Mr. Brown:

RE: COLONY DEVELOPMENT OPERATION, DRAFT  
ENVIRONMENTAL IMPACT STATEMENT

We have reviewed the draft environmental impact statement for the proposed development of oil shale resources by the Colony Development Corporation. This environmental impact statement is very well written and quite complete. There are some areas, however, which we feel could use further amplification or were not covered.

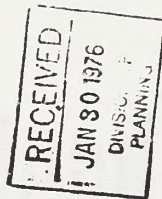
- 1) Potential slope stability problems have not been addressed fully enough in this EIS, particularly those slope stabilities related to cuts and fills associated with road and pipeline construction. In addition, the slope stability of the spent shale pile during and after placement.
- 2) Related to the slope stability problems is the control of drainage throughout the project area. Of particular concern is the adequacy of the culvert under the spent shale. No calculation showing the expected peak flows and sediment content were provided.

In conclusion, in general the geologic aspects were quite adequately covered in this draft environmental impact statement. We do recommend, however, that the above items be given more consideration in the final environmental impact statement so that the slope stability of all cuts and fills and the spent shale pile will be assured throughout the lifetime of the project, as well as after completion of the project.

If we can be of further assistance, please contact our office.

Sincerely,

David C. Shelton  
Engineering Geologist



A-6-86

DCS/jp

#-44

RICHARD D. LAMM  
GOVERNOR

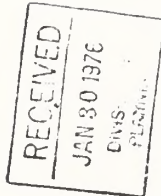


JOHN W. FOLD  
Director

COLORADO GEOLOGICAL SURVEY  
DEPARTMENT OF NATURAL RESOURCES

254 COLUMBINE BUILDING - 1845 SHERMAN STREET  
DENVER, COLORADO 80203 - PHONE 692-2611

January 28, 1976



Richard L. Brown  
Colorado Division of Planning  
1845 Sherman Street  
Denver, Colorado 80203

Dear Mr. Brown:

RE: AN OIL SPILL CONTINGENCY AND RESPONSE  
PLAN FOR A PROPOSED PIPELINE SYSTEM (COLONY)

We have read and reviewed the above referenced EIS and have no comment. The scope of this report is out of our area of concern. Only briefly were geologic conditions or hazards mentioned.

We feel that structural failure, if any, of the pipeline will in part be associated with unstable soils and bedrock. A review of the geologic constraints of the proposed pipeline should be based on the engineering and geologic feasibility report and not on this report.

Sincerely,

L. R. Ladwig  
Engineering Geologist

LRL/jp

A-6-87



Form 1279-3  
(June 1984)

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TD 195 .04 C66  
Proposed deve  
shale resour

DATE LOANED	BORROWER

USDI - BLM

